QUEENSLAND AGRICULTURAL JOURNAL

VOL. XIII. MAY, 1920. PART 5.

Agriculture.

ELEPHANT GRASS.

We have occasionally received inquiries as to the value of elephant grass as a fodder for stock. Lately a New South Wales farmer wrote to the "Producers' Review," Brisbane, the following letter eulogising the plant as valuable fodder for the Downs. The matter was referred to the Director of Agriculture, Mr. H. C. Quodling, whose opinion on the so-called grass is attached.

The writer said:—"It is now some years since I introduced this famous grass from Rhodesia, South Africa, and I must say that it has exceeded my most sanguine expectations as a heavy-yielding, drought-resisting, and nutritious fodder. Although it is known to some slight extent in Queensland, much good may result to those who have not yet given it a trial by informing them about it. In its native home it reaches a height of 20 ft., but for fodder, when cultivated, it should be cut once every three months, giving a return each time of about 10 tons per acre. It is a very rapid grower, is relished by all classes of stock, and is said by analysts to be much richer than either green maize or cow cane. A South African authority says: 'The grass grows very rapidly and can be cut frequently, and is greatly relished by all classes of stock—horses, cattle, and pigs—which seem to prefer it to lucerne, paspalum, and other grasses tried here. It is also very fattening.' It is permanent when once established, and the tufts or stools increase rapidly in size. The plants should be grown 3 ft. apart in rows 6 ft. wide. It should prove a great boon to farmers on the Downs."

Mr. Quodling, in reply:—"Elephant grass is a misnomer, in the sense that it is not adapted for grazing off like ordinary grass. It is a strong-growing, free-stooling plant, belonging to the same family as pearl millet. The crop is adapted for semi-tropical and tropical conditions more so than for temperate parts of the State, where frosts would adversely affect it. It is propagated from cuttings of the stem, similarly to sugar-cane; also from seed. Successive cuttings of fodder can be made during the growing season. As there are several excellent varieties of sorghums of approved value, I do not think there is any reason for advocating the growth of elephant grass with a view to excluding them, but the plant will fill a useful place."

ELEPHANT OR NAPIER GRASS.

We have of late received several inquiries as to the value of Elephant Grass as a fodder plant for stock, and the consensus of opinion of the instructors in the Director of Agriculture's Department is decidedly adverse to it.

Mr. A. E. Gibson, Instructor in Agriculture, writes as follows on the subject:—

"Several inquiries having been directed to the Department of Agriculture on the subject of Elephant Grass, the opportunity is taken of giving readers of the 'Queensland Agricultural Journal' an idea of what this so-called 'grass' is really like. Compared with members of the sorghum family, it is an inferior fodder, but has, no doubt, the recommendation of being able to produce a certain amount of coarse material which can be used as stock food when other forage plants having a higher feeding value are scarce.

"The tops of the plant are succulent, but the lower portions become extremely hard, and are somewhat of the nature of bamboo when matured. The plants growing

PLATE 15.—ELEPHANT OR NAPIER GRASS, GROWN ON THE PROPERTY OF MR. C. R. WILSON, GLASSHOUSE MOUNTAINS.

on Mr. Wilson's property easily reached 9 ft., whilst individual stalks would exceed this height.

"Mr. Wilson also cultivates a considerable amount of Guinea Grass (*P. maximum*), of which grass he holds a very high opinion, and states that for forage purposes in this district it is above all others, being a quick grower and providing heavy yields of good succulent material which readily lends itself to curing. This plant is usually propagated by division of the roots, owing to the difficulty of securing seed of good germinative quality, and if planted in a suitable situation in drills 3 ft. 6 in. to 4 ft. apart, and given proper cultivation, gives heavy yields.

"The plant stools remarkably and easily attains, under favourable conditions, a height of from 6 ft. to 8 ft."

The accompanying photograph of the so-called grass was taken on the farm of Mr. C. R. Wilson, Glasshouse Mountains, and clearly shows the characteristics described by Mr. Gibson.

TOBACCO CULTIVATION.

The high prices obtaining for tobacco-leaf should be encouragement for its more extensive cultivation. Manufacturers in this country and even in America experience difficulty in obtaining adequate supplies. The British-Australasian Tobacco Company are offering 2s. 6d. per lb. for bright lemon-colour leaf (flue-cured) pipe tobacco. First-grade cigar-leaf realises 2s. 6d. per lb. in the Melbourne auction mart, and no flue-curing is required. The average yield per acre is 1,000 lb. This has been improved upon in America, and in the Lancaster County (Penn.) 1 ton per acre of fine cigar-leaf is being obtained. Unfortunately, the Queensland grower is ignorant of these improved American methods, and generally the cultivation and curing are very backward. The industry is well protected; for instance, the duty on cigars is 10s. per lb., and on manufactured tobacco, plug, cut, leaf, cigarette, &c., 7s. 3d. per lb.

The output of leaf from the Bowen district varies from 20,000 lb. to 40,000 lb. per annum, according to the season experienced. The output of pipe tobacco leaf from the Texas district is about 60,000 lb. or 70,000 lb., mostly Chinese-grown. Australia's annual importation of cigar-leaf only from the United States of America alone is approximately 500,000 lb. It is therefore seen that there is ample scope for the tobacco planter in this country.

Tobacco, as a crop, requires skill and patience and constant care, but there is certainly no hard labour attached to it. Indeed, the greater half can be done by juvenile labour. Next to soil, a good shed, or "tobacco house," is indispensable. It can be constructed very cheaply, but strict attention must be paid to dimensions, internal fittings, facilities for the exclusion of bad weather, proper ventilation, and the admission of the proper amount of light, &c. Unless the tobacco has been properly housed, bulked, conditioned, and cured, the result will be a dry, tasteless weed which will not find many lovers.

Almost without exception, a certain Spanish variety has been grown in the Bowen district for the last ten years. This variety is out of date, being unsuitable for cigar-wrapper (wrapper-leaf, first grade, fetches about 16s. per lb., by the way). Other varieties should be tried out, such as Pennsylvanian and other eastern American tobacco, Cuban, and Manila. This is mentioned to show how backward the industry is, and the great scope for improvement in the selection of suitable varieties alone.

Tobacco, even as a side line crop in localities where the soil and climate are suitable, should be worthy of the farmer's attention. It stands the dry weather well, and a farmer having 1 acre as a standby when other crops have failed would have something up his sleeve. While all the talk is going on about making Australia a self-contained country, here is tobacco, which ought to be a staple crop, practically receiving no encouragement.—NORMAN COBB, in the "Producers' Review."

DEVELOPING THE GROWING OF COTTON.

EMPIRE COTTON—REPORT OF THE BOARD OF TRADE COMMITTEE.

On the 25th July, 1917, a Committee, under the chairmanship of Sir Henry Birchenough, Bart., K.C.M.G., was appointed by the President of the Board of Trade "to investigate the best means of developing the growing of cotton within the Empire, and to advise the Government as to the necessary measures to be taken for this purpose." It was a strong and representative Committee, consisting of twenty-one members appointed by the Board of Trade and seventeen members nominated by Government Departments, trade associations, and other public bodies. The recommendation that the Empire Cotton-growing Committee should be set up was made by the Departmental Committee on the Textile Trades, and this recommendation was supported by a Memorandum to the Prime Minister from the British Cotton-growing Association and other bodies, including the Liverpool and Manchester Cotton Associations, and all the Associations of employers and employed in the cotton industry.

It was pointed out that—

(1) The world is short of cotton, and the shortage is increasing.

(2) The shortage is greatest in the finer kinds of cotton which Great Britain uses so largely, and is generally more serious for Great Britain than for any other country.

(3) Eighty-five per cent. of the cotton used in Great Britain comes from the United States, which every year itself consumes more of its own cotton.

(4) The British Empire can (with proper development) grow the quantity and quality of cotton that it requires.

(5) Cotton-growing brings prosperity to the places suited for it.

It was also suggested that there was a wide sphere of work which needed to be done by someone, and which could only be done quickly with Government assistance. It was argued that it was the business of each colony or protectorate to decide for itself whether its climate, soil, population, and means of access to markets were suitable for cotton; also that it was the business of each colony to decide what kind of cotton it was most profitable to grow, to try experiments, to control the industry, and to provide the necessary transport and other facilities when cotton was shown to be profitable to the colony. Finally, it was suggested that great advantages would arise from the creation of some kind of central committee or department in the Imperial Government to advise and assist in connection with all measures which had to be taken, and, in particular, to bring all the resources of science into play to promote the extension and improvement of cotton-growing.

THE GENERAL SITUATION.

All the investigations that the Committee have made tend to confirm the statements made in this Memorandum. There is no doubt about the shortage of cotton, nor as to its importance to Great Britain and the British Empire. Since July, 1917, the situation has become decidedly worse. Owing in part to the necessity for growing more foodstuffs to meet the needs of the war, the cotton crops in the United States, in Egypt, and in India have been curtailed. Moreover, the seasons have been unfavourable, and the present season is giving rise to fears that the crops both in the United States and in Egypt will again be deficient. The advent of peace has in no way improved the situation. There is evidence of a world shortage of cotton goods, and there is no prospect whatever of there being a full supply of cotton for some years to come. Prices of cotton are already at levels far in excess of anything recorded since the cotton famine in the sixties. The Committee also find themselves able to endorse generally the opinions in the Memorandum. They are confident that if proper measures are taken, it should be possible to grow, within the Empire at any rate, a very large proportion of the cotton it requires. They are convinced that in many parts of the Empire cotton-growing will greatly increase the prosperity of the colonies which grow it. Further, they concur generally in the suggestions made in the Memorandum, and think it very necessary that the Committee should be empowered to advise and assist in all measures to be taken for the promotion of cotton-growing.

The Report of the Empire Cotton Inquiry Committee which has now been issued (Cmd. 523, 1s. 6d. net) is in two parts—Part I. giving the general views of the Committee, and setting forth general plans and proposals for the future; Part II., containing a detailed survey of the various territories of the Empire which are considered suitable for the cultivation of cotton. These countries include Egypt, the Sudan, Mesopotamia, Uganda, Nyasaland, Rhodesia, the Union of South Africa, Nigeria, and India. Under the heading "Cotton-growing—A Big Lancashire Scheme," the "London Times" of 7th April states that a scheme has been outlined in Lancashire for the creation of a great cotton-growing trust involving a trade levy to provide for the expenditure of many millions of pounds. Operatives and brokers, as well as manufacturers, have been invited to contribute to the trust. The chief source of the raw material has not yet been determined, but it is probable that it will be Nigeria.

It is, therefore, suggested that a fund should be raised on the basis of some kind of a levy from the cotton industry. A possible plan would be to impose a small sum on all cotton imported into the United Kingdom. So small a sum as 6d. per bale of 500 lb. would raise £100,000 per annum. Whatever plan is adopted, and whatever sum is found to be necessary, it will be trifling beside the interests involved.

Great Britain uses annually about 4,000,000 bales of cotton, valued at the present time at £150,000,000 and upwards. It is recognised that elasticity will be required, so that the sum annually provided may correspond with the expenditure which can, from time to time, be justified; and also that, so far as the industry provides funds, the bodies which find it must control its appropriation.—"Cotton," Official Journal of the Manchester Cotton Association, Limited.

A further report on this matter will be published by "Cotton," and will be reproduced in this Journal.

Referring to the above, we note that the only countries mentioned as probably most suitable for cotton cultivation within the British Empire are Africa and India. Northern Australia is not mentioned, presumably owing to the ingrained idea that cotton can only be grown profitably in countries where coloured labour is abundant.

We have only to look back a few years—say, to the date of the Civil War in the United States of America—to show that Queensland, without any coloured labour, supplied the British cotton mills with 10,643,771 lb. of raw cotton, of a value of

£443,490. That was in the eight years between 1866 and 1873. During that period the price of cotton in the British market was about 10d. per lb.

Many people fall into the error of thinking that the cessation of the bonus granted to exporters of cotton was the cause of the decline and final abandonment of the cotton industry in Queensland. This is quite a mistaken notion. The real reason for its abandonment was the tremendous fall in prices a year or two after the close of the American Civil War, when clean lint was only bringing 9 cents (4½d.) per lb. The Queensland farmer made satisfactory profits when he obtained from 1½d. to 2d. per lb. for his seed cotton sold to the proprietors of cotton ginneries in the colony, but it was manifestly impossible to grow cotton here in the face of such a small price in the British market; the farmers, therefore, gradually abandoned the business, but in 1915 there was strong evidence of a revival, especially as the Government erected ginning machinery, taking charge of all cotton sent to the gins, guaranteeing the grower a minimum price, and dividing all the profits of the sale of the finished article amongst the suppliers. For the past four years the latter have made good profits at no cost to themselves but picking and carting the produce or railing it to the Government ginnery. In 1919 growers received a clear 5½d. per lb., or, on an average, £22 18s. 4d. per acre, when the price of cotton in Liverpool was 11d. per lb. That price has now risen to 24¾d. per lb. and may go higher.—ED. "Q.A.J."

We have now received the "Journal of the Manchester Cotton Association" for 6th March, from which we take the following article on "Development of Cotton Growing," under the caption:—

"EMPIRE COTTON.

"LANCASHIRE MEMBERS AND STATE AID.

"The Lancashire Committee—that is, the whole body of Lancashire members of the House of Commons, irrespective of party—had their first real meeting this week. They dealt entirely with cotton, and mainly with the proposals of the Empire Cotton-growing Committee for extending the cultivation of cotton in the Empire. Letters were read from the Empire Cotton-growing Committee asking the Lancashire members to support the Lord Mayor of Manchester, on behalf of Lancashire, in asking the Prime Minister to receive a deputation to obtain the active assistance of the Government in carrying out the recommendations in the report of the Committee. The Government, through Sir Auckland Geddes, has agreed to contribute £10,000 a year for five years for research purposes. The Lancashire cotton trade, on its part, has promised to levy a voluntary tax upon itself of 6d. a bale, to raise £100,000 a year, as recommended in the report.

"The desire now is that the Government should grant an equal amount of £100,000 a year, to be applied to practical demonstration in cotton-growing in areas that may be selected, and that this shall not be for the advantage of any individuals or firms connected with the cotton trade, but for the special purpose of practical demonstration to the natives in the various possible cotton-growing areas in the best methods of making a commercial success of cotton-growing. The actual results of this, it is believed, would be a quicker development of the Empire, which would bring up the revenues of the various dependencies and ease the burden on the Treasury. The experience of the last seventeen years of the operations of the British Cotton-growing Association proves conclusively that the growth of cotton has enabled certain dependencies to become self-supporting, instead of being a charge on the British taxpayer. The proposed deputation will try to persuade the Prime Minister to take an active personal interest in work which is of so much national importance. If he agrees to receive a deputation it is to consist of representatives of all classes of trades in Lancashire, not merely of the cotton trade, and the representatives of local authorities and all the Lancashire members of Parliament.

"The meeting agreed to back up the Lord Mayor in his request to the Prime Minister, and a resolution to that effect was carried. Another resolution was passed appointing Sir John Harmood-Banner, Lieutenant Sugden, and Mr. Waddington to interview the Prime Minister on the matter.

"*Use of the Cotton Control Board's Great Surplus.*—Another subject discussed by the Lancashire members of Parliament was the proposed Cotton Mission to the Far East. It was reported, however, that that had already been satisfactorily dealt with, and that there would be no further charge upon the Treasury for the Mission. The Treasury are already giving £3,000, but the Mission is expected to cost about £12,000. The meeting were informed that the Cotton Control Board were going to find the balance of £9,000 out of the surplus fund in their hands. This surplus is a very large one, amounting to over £1,000,000; that is, representing an income of £40,000 or £50,000 a year. A scheme is before the Board of Trade at present for disposing of the money. The scheme includes grants for research and education connected with the cotton trade.

"The only other subject discussed at the meeting was the question of the grant of £6,000,000 given to the Sudan Government by the Home Government last year for irrigation south of Khartoum. It was resolved to ask the Government what progress had been made in this work, or if there proved to be no official information at present to ask the Government to obtain it."

At a meeting of the Manchester Branch of the Federation of British Industries in March last, Sir Henry Birchenough, chairman of the Empire Cotton-growing Committee, stated that "almost all the areas suitable for cotton-growing in the Empire, apart from Egypt and India, were in native occupation, and cultivation could only be rapidly extended if we were prepared to supply a large staff of trained white men to instruct and supervise the natives. The other point which had been criticised was that of finance. The industry had shown its willingness to submit to a levy of 6d. a bale, amounting to £100,000 a year. There was every reason to believe that the Colonial Governments would welcome and help the movement to develop cotton-growing in their territories. The British Government had agreed to grant £10,000 a year for office expenses. They had also put before the Cabinet a proposal for a large capital grant. He was sanguine that the grant would be secured, but any pressure which could be exercised from Lancashire would be helpful. The next step was the organisation of a body capable of making appropriate and effective use of the funds. A business like this could not be carried on by an amateur committee. He hoped they would be able to work in close co-operation with the British Cotton Growing Committee, or else to absorb it. Whatever body was set up could not cover the whole ground, and there would be ample room for commercial enterprise."

Were it not for the word "almost," we should be led into a possible error, by inferring that he intended to convey that all areas suitable for cotton-growing in the Empire were in native occupation. This is certainly not the case in Queensland, which extends from 10 to 28 south latitude, and where cotton can be grown on the vast extent of its coastlands. As for native occupation, these original possessors of the land are few and far between, and never have they been engaged in any other occupation but hunting until the white man came with his cattle and horses. Cultivation of the soil was not one of the occupations of the Australian blackfellow.

But that cotton can be, and has been, and is being grown to a profit from north to south has been proved years ago, and is being proved to-day. Why, then, should such a State as this be ignored by the Lancashire Committee? It has also been shown that no black labour is needed in Queensland, either for cotton-growing, or in the sugar-cane industry. Why then should one be led to infer that Queensland is included in the unsuitable lands for cotton-growing, and that all suitable lands are in the occupation of natives?

AUSTRALIAN FLAX IN ENGLAND.

The Victorian Department of Agriculture, in April last, received advice, through the Commonwealth Flax Committee, that the first consignment of 14 tons of Victorian flax fibre to be disposed of under open market conditions in England has realised the price of £325 per ton.

In previous issues of this Journal, we have published several articles dealing with the cultivation and preparation of this valuable fibre, the supply of which has never overtaken the demand, and at present is far below the requirements. In the January number, 1920, we republished an instructive letter on the subject by Mr. R. F. Strachan, Goondiwindi, to the "Brisbane Courier," to which we refer any of our readers who may feel interested in the possibilities of this crop.

Although several farmers on the Darling Downs sowed small areas of from 2 to 3 acres during this year, the dry weather during the growing season will doubtless have adversely affected the harvest, and, even were full crops obtained, there would still remain the disability of the want of a flaxmill. We have, in previous articles, shown how the flax-growers in the continental countries of Europe deal with their small crops by the use of primitive implements as described in this Journal for October, 1903, and in subsequent Journals.

A PROMISING NEW SYSTEM OF COTTON-PICKING.

With reference to the information on cotton-picking, supplied by Mr. Daniel Jones in the April number of the journal, the "Popular Mechanic's Magazine" of January, 1920, writes:—

"By the simple process of picking cotton in the boll, incubating the crop thus gathered, and there extracting the fibre by machine, the inventor of a new system promises a practical metamorphosis of the whole cotton industry. A 150,000 dollar (£30,000) plant already has proved the practicability of the idea. The success of the method rests on the discovery that cotton matures as much as three weeks before the hull opens, and actually deteriorates from the time the boll first cracks. Under the new plan the bolls are picked with considerable saving of labour when they begin to crack. The harvest of green bolls is then loaded into a machine, incubated in steam-heated chambers, and finally opened by simple mechanism. In 55 minutes or less, all the contained cotton is delivered ready for the gins. One machine unit produces one bale an hour requiring 20 h.p. to run, 20 lb. of steam, and two attendants. Cotton so picked is declared to be cleaner, brighter, stronger, and longer-fibred than the staple as handled at present."

MARKET GARDENING.

MANURING VEGETABLE CROPS.

Mr. J. C. Brünnich, Agricultural Chemist, replying to a correspondent asking for information on this matter, said: "'Blood and bone' and basic superphosphates are totally different manures, as the former contains nitrogen and phosphoric acid; the latter, only phosphoric acid. A good all-round complete fertiliser for vegetables should contain from 8 to 10 per cent. phosphoric acid, 3 to 6 per cent. of nitrogen, and 2 to 3 per cent. of potash. If land is deficient in lime, apply crushed limestone or carbide waste."

For the information of those engaged in market gardening for pleasure or profit, the Department of Agriculture has issued a pamphlet on "Complete Fertilisers for Farm and Orchard."

REDUCING RAILWAY COSTS.

Owing to the universal rise in railway rates in the United Kingdom and elsewhere, increased attention is being given to reducing the bulk of goods transported. For this purpose, a baling-press is, in many cases, invaluable. The latest practice in this type of appliance is represented by a 200-ton electric press supplied to an Indian company for the baling of hides. Special provision is made for rapid and safe operation. In lowering the press, or raising light loads, the motor speeds up to 1,200 revolutions per minute, giving the press-table a very fast travel. When the load comes on, the motor automatically slows down, and exerts increasing pressure until the limit is reached. At that point, a switch automatically stops the motor. By means of an electro-magnetic disc brake on the motor shaft the pressure exerted can be maintained for an indefinite period. All the control is carried out by three press buttons. The current consumed in forming each bale is only one-eighth of a unit.—"Industrial Publicity Service," London.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1920.

The following are the results of the sixteenth egg-laying competition held at the Queensland Agricultural College, Gatton, which commenced on 3rd April, 1919. Owing to the Easter holidays it was necessary to disband most of the pens on 28th March. However, those pens marked (f) were allowed to complete the full year, and their records are given up to and including 2nd April. Mrs. R. Holmes's pen of Black Orpingtons, with a score of 1,619, has put up a record for the breed. Mr. R. Burns's E. bird has equalled the previous record, also held by Mr. Burns, of 335 eggs for the year, but it is to be regretted that this time, as on the previous occasion, the average weight of eggs was below the standard 2-oz. average.

The prizes are awarded as follows:—

Aggregate for Group of Six Hens.—Light breeds: 1st, J. M. Manson (f), 1,596; 2nd, E. A. Smith, 1,518; 3rd, W. Hindes, 1,477. Heavy breeds: 1st, R. Holmes (f), 1,619; 2nd, R. Burns (f) 1,541; 3rd, W. Smith, 1,406.

Single Hens.—Light breeds: B. Caswell, E. (f), 289; 2nd, J. M. Manson, O. (f), 286; 3rd, Dr. E. C. Jennings, F. (f), 280. Heavy breeds: 1st, Kelvin Poultry Farm, A. (f), 290; 2nd, Jas. Ferguson, B. (f), 278; 3rd, R. Holmes, A. (f), 274.

Winter Laying.—Light breeds: 1st, J. M. Manson, 488; 2nd, W. Hindes, 481; 3rd, Dixie Egg Plant, 466. Heavy breeds: 1st, R. Holmes, 544; 2nd, R. Burns, 469; 3rd, A. E. Walters, 452.

Those groups or individual hens shown with higher scores were disqualified because the average weight of eggs was under 2 oz. The following are the individual records:—

Competitors.	Breed.	March.	Total.
	LIGHT BREEDS.		
*T. Fanning	White Leghorns ...	138	1,627
*J. M. Manson	Do.	120	1,596
*E. A. Smith	Do.	110	1 518
*W. Hindes	Do.	104	1,477
*Dr. E. C. Jennings	Do.	111	1,431
*G. W. Hindes	Do.	109	1,403
*W. Becker	Do.	108	1,389
*Haden Poultry Farm	Do.	86	1,345
*Range Poultry Farm	Do.	73	1,335
*B. Caswell	Do.	74	1,322
*Quinn's Post Poultry Farm	Do.	63	1,317
*Dixie Egg Plant	Do.	49	1,315
*C. P. Buchanan	Do.	85	1,300
*Harold Fraser	Do.	77	1,289
S. McPherson	Do.	79	1,270

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Marcb.	Total.
LIGHT BREEDS—*continued.*			
*W. Lyell	White Leghorn	97	1,268
J. H. Jones (Toowoomba)	Do.	65	1,264
W. A. Wilson	Do.	79	1,255
*L. G. Innes	Do.	54	1,234
*J. J. Davies	Do.	70	1,227
*Thos. Taylor	Do.	76	1,226
*Mrs. A. G. Kurth	Do.	69	1,219
*Mrs. L. F. Anderson	Do.	44	1,206
S. W. Rooney	Do.	55	1,183
G. J. Byrnes	Do.	55	1,183
Mrs. N. Charteris...	Do.	92	1,180
J. Williams	Do.	45	1,141
N. A. Singer	Do.	92	1,131
G. Trapp	Do.	55	1,118
*Mrs. R. Hunter	Do.	47	1,113
*O. W. J. Whitman	Do.	70	1,111
H. A. Jones (Orallo)	Do.	64	1,107
C. A. Goos	Do.	54	1,075
B. Chester	Do.	51	1,067
Oakleigh Poultry Farm	Do.	67	1,062
H. O. Jones (Blackstone)	Do.	48	1,050
G. H. Kettle	Do.	37	1,026
J. W. Newton	Do.	48	1,020
R. C. J. Turner	Do.	59	1,008
J. H. Dunbar	Anconas	75	974
W. Morrissey	White Leghorns ...	46	933
HEAVY BREEDS.			
*R. Holmes	Black Orpingtons ...	125	1,619
*E. F. Dennis	Do.	99	1,547
*R. Burns	Do.	123	1,541
*E. M. Larsen	Do.	83	1,420
*W. Smith	Do.	109	1,406
*A. E. Walters	Do.	76	1,380
*E. Morris	Do.	99	1,336
*Kelvin Poultry Farm	Plymouth Rocks ...	95	1,309
*Mars Poultry Farm	Black Orpingtons ...	87	1,271
Geo. Nutt	Do.	65	1,267
*T. Hindley	Do.	78	1,254
R. B. Sparrow	Do.	100	1,248
*Jas. Ferguson	Chinese Langshans ...	100	1,233
*Nobby Poultry Farm	Black Orpingtons ...	59	1,223
*A. Shanks	Do.	42	1,182
A. Homan	Do.	87	1,147
Burleigh Pens	Do.	84	1,141
*D. Fulton...	Do.	46	1,132
*W. H. Reilly	Chinese Langshans ...	60	1,121
J. A. Cornwell	Black Orpingtons ...	84	1,083
*T. W. Leney	Do.	52	1,055
C. H. Singer	Do.	68	1,023
*H. Puff	Rhode Island Reds ...	48	1,001
A. Gaydon	Black Orpingtons ...	74	985
H. Ashworth	Do.	60	979
*T. B. Barber	Do.	48	953
Total	...	5,053	82,171

* Indicates that the pen is engaged in single hen test.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
T. Fanning (f)	269	254	267	287	266	284	1,627
J. M. Manson (f)	271	253	286	279	235	272	1,596
E. A. Smith	253	245	268	252	237	263	1,518
W. Hindes	260	258	256	225	228	250	1,477
Dr. Jennings (f)	246	221	236	231	217	280	1,431
G. W. Hindes	253	238	255	228	210	219	1,403
W. Becker	263	243	251	224	192	216	1,389
Haden Poultry Farm	257	240	233	216	176	223	1,345
Range Poultry Farm	207	234	243	240	200	211	1,335
B. Caswell (f)	178	171	213	256	289	215	1,322
Quinn's Post Poultry Farm ..	211	211	222	265	203	205	1,317
Dixie Egg Plant	203	222	235	202	217	236	1,315
C. P. Buchanan	178	255	188	221	218	240	1,300
H. Fraser	172	246	253	225	158	235	1,289
W. Lyell	204	232	238	198	210	186	1,268
L. G. Innes	149	247	170	210	245	213	1,234
J. J. Davies	213	220	218	177	193	206	1,227
Thos. Taylor	197	170	194	232	239	194	1,226
Mrs. A. G. Kurth	256	222	219	187	166	169	1,219
Mrs. L. F. Anderson	216	240	185	216	161	188	1,206
Mrs. R. Hunter	183	121	216	173	203	217	1,113
O. W. J. Whitman	179	222	161	163	200	186	1,111

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Holmes (f)	274	272	299	242	317	215	1,619
E. F. Dennis	247	248	274	258	227	293	1,547
R. Burns (f)	270	224	246	335	247	219	1,541
E. M. Larsen	256	243	278	223	248	172	1,420
W. Smith	220	247	239	205	252	243	1,406
A. E. Walters	254	192	241	235	219	239	1,380
E. Morris	210	213	241	227	265	180	1,336
Kelvin Poultry Farm (f)	290	195	217	163	232	212	1,309
Mars Poultry Farm	198	249	246	185	170	223	1,271
T. Hindley	208	228	191	214	189	224	1,254
Jas. Ferguson (f)	210	278	171	175	206	193	1,233
Nobby Poultry Farm	175	191	179	196	231	251	1,223
A. Shanks	86	158	252	197	226	263	1,182
D. Fulton	172	193	187	170	191	219	1,132
W. H. Reilly	172	160	222	211	166	190	1,121
F. W. Leney	113	170	191	222	170	189	1,055
H. Puff	202	159	169	205	96	170	1,001
T. B. Barber	152	171	118	166	172	164	953

CUTHBERT POTTS,
Principal.

ELECTRICITY AND EGG-LAYING.

The "Journal of the National Society of Belgian Agriculturists" states that it is reported that a farmer in Indiana has succeeded in increasing the egg-laying power of his fowls by installing the electric light in his poultry-house from sundown to 10 p.m., and in the morning from 4 a.m. to daylight. This experiment is really not a new idea, as we remember that, about thirty years ago, a poultry farmer, in the French province of Liége, heated his poultry-house during the winter and illuminated it at dawn by means of petrol lamps. The fowls, being thus awakened,

were immediately fed. The results of this treatment were, it appears, highly satisfactory. It can be understood that, by increasing the time of wakefulness, the birds are induced to feed to a larger extent, which results in a larger egg-production.

Now, at this time, when eggs are so dear, here we have an idea which it would be interesting to try in our country.

BIG MONEY IN MUSCOVY DUCKS.

By R. T. G. CAREY (Muscovy Breeder), Beerwah.

Are you aware that these aquatic fowls have more flesh upon their body than any other poultry, and that they eat less proportionately for the same weight of meat gained by a fowl? Are you also aware that the profits are of greater preponderance than those derived from any other of the feathered kingdom? Yet there are people who hold a contrary opinion, maintaining that the food consumption of the Muscovy is greater than the value returned. Let us prove the argument—"More meat; less food; greater profit"—which may seem a lying fallacy; nevertheless it is a felicitous lie! But breeders know otherwise, and it is upon such a weak presumption, or it is the wrong idea, wherein the public err.

Let an intending breeder secure a pen of Muscovy ducklings (drakes preferably) —about a dozen, say, just one month old; place them in a small enclosure, termed a pen; feed four times per diem, all that they can eat clean up (remove the uneaten food) at each meal. Watch the marvellous progress, the rapid growth, in the short space of twelve to fourteen weeks, the size, the weight of those drakes, weighing 12-14 lb. each, or a gain of 1 lb. of flesh per week; then that prospective investigator will be astounded. Assuredly, for each pound weight gained by the drakes, the cost in food consumption is less, for the weight so gained. Duck flesh, as a rule, is generally purchased in the markets, from 6d. to 8d. per lb. Therefore, in the short space of twelve to fourteen weeks of growth there is, approximately, 156 lb. of good duck flesh—a weight not gained by any other animated creature—pig, ox, goat, or lamb—representing a value of £5 4s., at 8d. per lb. The food consumed for each pound raised may be £2 5s. 6d., or 3½d. per lb.; the profit, therefore, is about £2 18s. 6d., or 51 per cent. above the cost of rearing a dozen drakes to maturity.

Anyone desirous of trying the above experiment to minimise the butcher's bill can, without much inconvenience, do so with the help of those handsome aquatic fowls. If unable to breed them, one can purchase them in quantities that suit one's requirements. Much of the family table offal contributes the greater part of their upkeep, which lessens the cost, and with a proportion of bran, pollard, maizemeal, and beef scraps added, will constitute their chief diet. Try the experiment for a season; learn how to relish the juicy Muscovy duck-meat with green peas, and the trial must convince him or her how remunerative this proposition may prove.

The sceptical venturer fears that the idea above suggested is too alluring, and the task of managing a few Muscovy ducks in a pen rather disheartening, because of the monotonous routine of attending to their daily requirements. But let that duty be performed by some enthusiast, who profits by their want of zeal, although believing the doctrine of "everything in nature is ordered for the best," and that it is best for others to perform the breeding and rearing of Muscovy ducks so long as their requisition bill can be supplied at short notice.

Pessimistically, many entertain the idea that those titanic waterfowls are not worth the attention, looking upon them as a pest, ever ready to decry the Muscovy duck as a docile, lazy, and quackless bird, and will have nothing to do with the rearing or breeding of them—until, alas! seized with the hen-fever—or "Muscovy mania! (Is that it?)—they launch into the duck-breeding business with such zeal and energy that friends are astonished at their enthusiasm, having realised the value of the Muscovy's potentialities as a white meat producer, &c., they feverishly erect quarters, feedroom, and nurseries for the propagating of those gigantic aquatic fowls. What a change! What an alteration in the home circle, every member of the family having to attend to the requirements of the Muscovies, nothing is neglected, while they are leaving something of the monotonous jobs that fall to poultry-raising, and which are, nevertheless, performed with all the zeal and thoroughness that characterise the work of Muscovy duck-breeding.

[The foregoing article on "Muscovy Ducks" will close the series of excellent papers on all that concerns this class of poultry, for which our thanks are due to Mr. R. T. G. Carey, of Pindora Poultry Farm, Beerwah. Mr. Carey has long made a study of the Muscovy duck, from the egg to the block, and his lessons on its treatment have been much appreciated by readers of the Poultry Section of the "Queensland Agricultural Journal."—EDITOR "Q.A.J."].

CHICKEN-POX OR WARTS.

By D. WALLACE, Rocklea.

Chicken-pox may be said to be endemic in Queensland. Fortunate is the poultryman whose young stock of the previous season's hatch do not contract it in the autumn—fortunate because in spite of early hatching and skilful rearing an autumn visitation of the malady, however slight, is an almost certain thing.

It revives each season at a time when eggs show a very appreciable increase on the past summer's prices. Not infrequently it runs through a whole flock of pullets, inevitably seriously reducing and even almost wholly suspending the egg yield at a time when the more favourable prices bring substantial relief and compensation for a previous period of slackness; also, the sale of stock is interfered with until the disease has disappeared.

The financial loss resulting from this disease throughout the Commonwealth each season would provide a surprise if figures were available.

Birds twelve months old or over are practically immune to it unless in close contact with infected young stock. In addition to this, the following conditions in connection with the diesase are conspicuous:—

Late-hatched chickens take it more readily and more severely, early-hatched birds being easily protected, at least against a severe form of the trouble, by treatment to be described hereafter.

Roup frequently accompanies it, though a distinctly different disease, and is not necessarily a concomitant condition.

Dampness is a condition favourable to the contraction and spread of warts particularly in the autumn. In yards where cockerels are penned in a limited area and are denied range and green feed they are the first of the flock to contract it.

It is highly infectious by mere contact.

It is not necessarily fly- or mosquito- borne, birds in gauzed coops being readily infected if kept in the vicinity of infected birds.

Little or nothing has been done by bacteriologists in the way of investigating the causation of this disease beyond ascertaining whether there was any connection between it and human "chicken pox." This was done in California; and when it was found that the two were not identical, the matter was dropped. At the time the enormous expansion of the poultry industry could not have been foreseen.

The causal organism is unknown, but apparently its growth is favoured by moisture and warmth, the high bodily temperature of a fowl (as high as 107 degrees in a healthy bird) being particularly suitable to it. With the approach of cold weather, it soon loses virulence. Like smallpox in human beings, one attack confers immunity against any subsequent attack. The pustular eruptions resemble those of smallpox though they have no foul smell, and the extremely high infectivity is much the same. Like the causal agent of smallpox, that of chicken pox is probably also a filter pass. It cannot be said to be evanescent for if allowed to remain in a flock, it acquires great virulence and becomes most persistent.

Chicken pox varies in virulence under varying climatic and geographical conditions. In China, for instance, I have seen it so virulent as to appear on chickens' toes and leave scars and depressions on the face and base of beak. In that country it is very fatal on a low, damp soil. Ostertag states:—The infection begins in the mucous lining of the mouth, and spreads to the outer parts of the bird's head. The fact that mucous is freely shaken from an otherwise apparently healthy bird's mouth a day or so prior to the appearance on the featherless portions of the head of small white blisters, which develop into ulcers, would appear to lend colour to the idea.

Possibly, like the normally harmless pneumococcus in the human saliva, the causal organism of warts becomes pathogenic under certain conditions, and produces chicken pox, as the pneumococci do pneumonia. Great depression and a marked lowering of the bird's vitality accompany the disease, and this in itself gives the youngster a tremendous set-back. Bird after bird contracts it, and the whole flock mope about partly or wholly unable to see, their heads a mass of loathsome sores. The poultry-man is kept busy doctoring them, with nothing coming in for eggs to add to his worries.

What really matters in an outbreak of warts is the great liability of the birds to contract roup. On top of roup, if not promptly and successfully treated, come pneumonia, bronchitis ("throat rattles"), and "roup eye," a form of conjunctivitis which may keep a bird blind and useless for weeks.

The incubation period of warts is from four to eight days, according to virulence and the condition of the flock. When the disease is prevalent, all new birds should be quarantined for at least eight days before being allowed to mingle with one's flock.

By "incubation period" is meant, not the duration of the disease, but the time that elapses between the moment of infection and the first manifestations of the malady.

Prevention and treatment will be dealt with in a following contribution.

Dairying.

THE MANUFACTURE OF CHEDDAR CHEESE.

BY R. B. TENNENT, N.D.D.

PRELIMINARY CONSIDERATIONS.

To produce a really high-grade Cheddar cheese, it is first of all essential that the milk should be of the best quality, free from taints or manurial contamination. The two chief faults found with milk when delivered at the cheese factory are, firstly, too much acidity, and secondly, pollution with foreign matter such as hairs, straw, dung, &c. Although all first-class makers of Cheddars fully realise the importance of manufacturing from a clean, pure, sound milk, it is unfortunately true that the farmer as a rule does not sufficiently realise how much the flavour and keeping qualities of the cheese depend on the initial purity of the milk. One of the methods by which the average quality of cheese made in this State can be most rapidly improved is by the strict observance on the part of the farmer of scrupulous cleanliness in the production and handling of cheese milk; and if he is shown how he will profit financially by helping to put a really high-class cheese on the market, commanding a high price, the incentive for him to observe cleanliness will be greatly increased. It should, therefore, be the aim of every cheese-factory manager to inculcate the suppliers with the need of hygienic milk-production, and impress upon them the benefits accruing from such a practice.

Milk from cows suffering with hereditary or contagious diseases—such as tuberculosis, cow-pox, or mastitis—should never be used for cheesemaking, and, above all, the animals should have sound, healthy udders. The milk of one cow infected with chronic mastitis might easily contaminate a whole batch of milk, and so introduce unexpected difficulties in the process of manufacture, rendering the production of a high-class article impossible. This is a real source of faulty cheese.

Cheesemaking will reveal any abnormality in the milk more surely than any other test; therefore, milk which is in any way abnormal should not be used. Colostrum, or the milk of the newly calved cows, should never be mixed with the cheese milk, the presence of even a small quantity of it being inimical; nor is it advisable to use the imlk of sick or fevered cows, cows far gone in lactation, or cows in sexual heat.

It should be remembered that highly flavoured foods often impart their distinctive flavour to the milk, and this is usually retained in the cheese. To prevent such an undesirable occurrence, foods which tend to taint the milk should be avoided. All fermented foods, or foods which are partly decomposed, should not be employed. The feeding of cows during the milking process should also be avoided, for when straw or hay is carried through the milking-shed, the air becomes dusty, and thereby increases the number of germs that find their way into the milk bucket.

The flanks of the cows should be kept free from manure, and prior to milking the udder and teats should be moistened with a damp cloth. The milkers should be personally clean, and should wash their hands before milking each cow. The foremilk which is highly contaminated should be rejected, and the use of hooded buckets is strongly recommended, as it reduces the initial contamination by nearly 60 per cent. As soon as the milk is withdrawn from the cow, it should be removed from the milking-shed to the milkroom, and there strained, preferably through an absorbent cotton filter. All utensils coming into contact with the milk should be kept scrupulously clean. (*N.B.*—See writer's article, "A Clean Milk Supply," in April (1920) issue of the Journal.) Attention to these points are of real importance in cheesemaking, and neglect of any of them will assuredly lower the quality of the produce.

PROCESS OF MANUFACTURE.

TREATMENT OF EVENING AND MORNING MILK.

Milk should be delivered to the factory twice daily—*i.e.*, after the morning milking and after the evening milking. The evening's milk, after having been received, weighed, sampled, and run into the vat, should be immediately cooled to a temperature of from 68 degrees to 70 degrees Fahr., depending on weather conditions and season. The usual way is to run the milk over a cooler, or to circulate cold water in the jacket of the vat, stirring the milk at the same time. In very hot weather, where water is plentiful, the usual method is to leave it running in the

jacket overnight. In winter, when the temperature of the milk falls quickly, it should be aerated, but not cooled. The whole object in cooling the evening's milk is to get rid of any animal taint and to reduce it to such a temperature as will be suitable for the *slow* development of the desirable lactic acid organisms which are invariably present in properly handled milk.

It is the custom with some cheesemakers to add a few drops of starter to the evening's milk, and where cheese has shown a tendency to be slow, or where undesirable fermentation has been troublesome, this practice is to be confidently recommended. Great care, however, must be exercised, a few drops only being added to the vat, otherwise a fast cheese will result. It should be remembered that when starter is added in the evening, less than the usual amount will be required in the morning.

In the morning the cheesemaker should take the temperature of the evening's milk, and in this way an indication of the development of acid is obtained. Whenever the temperature is over 70 degrees Fahr. less starter should be added, and the development of acidity during the ripening process must be carefully watched.

The cream is then skimmed off and returned to the vat through a cheesecloth, being thoroughly mixed with the milk. In winter it is advisable to heat the cream to 90 degrees Fahr. before returning it to the vat, thus ensuring a thorough distribution of the fat.

If there is cold water in the jacket of the vat, it is now run off and the milk is raised usually to 80 degrees Fahr. before the addition of the morning milk.

Adding the Starter.

The starter is then added, and it is a common practice with some cheesemakers to add it to the skimmed cream before returning the latter to the vat. If this is done, care must be taken to avoid heating the cream to more than 100 degrees Fahr., otherwise the starter will be rendered practically useless. The quantity of starter used depends on the season, type of cheese made (whether slow or fast), and on the condition of the milk. In this matter the cheesemaker must be guided by the record of the previous day's cheese. The general rule being to add the smallest quantity of starter that will give a normally working cheese; that is, one in which the making process occupies from seven to eight hours. As an indication, it is usual to add from ½ to 1 per cent.—*i.e.*, 1 lb. of starter to 20 gallons of milk on the average. In winter the quantity should be increased owing to the slower development of acidity. It is better to add an under-quantity than an over-quantity; for, in the former case, the only disadvantage will be a longer period in the making process, whereas if too much starter is added the time of making will be short, acid will form too rapidly, with the result that the cured cheese will have a dry body and a short, brittle texture.

Management of Starter.

The two most important characterists of a starter are purity and vigour. A vigorous starter regulates the rate of acid production in the curd, which thus governs the time of making, and in addition controls or suppresses any abnormal fermentations in the cheese milk, this latter being a most important factor. The purity of the starter greatly influences the ultimate flavour of the cheese, for an impure starter, no matter how vigorous, cannot impart the fine flavour which is so characteristic of a good Cheddar cheese. It should be realised by the cheesemaker that the object of using a starter is not to shorten the making period, but to suppress abnormal fermentations and impart a first-class flavour to the finished article.

Starter is at present put on the market in powder form, and, although very convenient, requires a certain amount of technical skill in preparation. It is much better to procure starter in a liquid form from the Stock Experiment Station, Yeerongpilly, where it is sold in sealed bottles at 1s. 6d. per bottle of approximately 4 oz. Instructions on the preparation of a starter from these cultures accompanies each bottle.

It is important that fresh starter should be made each day from pasteurised milk, and it should be in a soft, creamy condition when ready for use. It is best kept in an enamel bucket, which must be thoroughly scalded before use, and kept covered with a clean muslin cloth. Excess of acid production greatly weakens the power of a starter, therefore it should not be allowed to become overripe. If it so happens that the starter becomes too thick, it should be cooled down, and some pasteurised milk added. Exposure to direct sunlight is detrimental, and is to be avoided. A good starter will ripen in from six to eight hours, and has a pleasant, clean, acid taste, free from any bitterness. If a starter becomes gassy and loses its vigour it should be replaced by a new one, and it is to be remembered that vigour alone is of little value unless accompanied by that other essential quality—purity.

RIPENING THE MILK.

The morning's milk is run into the vat after the starter has been added and the contents raised to the renneting temperature of 84 degrees Fahr. by the use of the steampipe connection. The milk is now allowed to ripen, an occasional stirring being given to maintain a uniform temperature and equal distribution of fat. The factors which determine the length of time required for ripening depend chiefly on the amount of acid formed overnight in the evening milk, the vigour and kind of starter, the quality of the cheese milk, and the type of cheese required. The average length of time is two hours from the addition of the starter, or one hour from the time the last morning milk was added to the vat.

In Australia the demand for uncoloured cheese is small, therefore most Cheddars made in this country are coloured with annatto, which is added during the ripening period, generally about a quarter of an hour before adding the rennet. It must be thoroughly mixed with the milk, otherwise unsightly coloured streaks will show in the finished cheese. The usual amount added is 2 oz. of annatto to 100 gallons of milk. To ensure thorough distribution throughout the milk the colouring matter may be diluted with five or six times its volume of water.

Rennet is added when the milk is considered ripe, and it is at this stage that many cheesemakers go wrong. Some makers estimate the degree of ripeness by the sense of smell; a few rely on the gift of imagination. The "rennet test" should be employed by cheesemakers to ascertain if the milk is in ripe condition for renneting. This test is simple, 4 oz. of milk being taken from the vat at 86 degrees Fahr., and to this is added 1 dr. rennet contained in a cup. The contents are immediately vigorously stirred with a teaspoon for five seconds. A few small pieces of cork are then dropped on to the surface of the rotating milk, and the number of seconds that elapse between the addition of the rennet and the cessation of movement of the floating cork gives the rennet test. The temperature of the milk must be 86 degrees Fahr. when the rennet is added; the rennet must be carefully measured, and the seconds carefully noted. For this latter purpose a stop-watch is very handy. In the case of new milk the rennet test is usually about 25 to 26 seconds; in milk ready for renneting, the rennet test should be approximately 21 to 22 seconds.

The "acidimeter test" is also largely used in this country, and in skilful hands gives excellent results. It should not, however, be used in preference to the "rennet test." The acidimeter consists of a graduated burette containing a solution of caustic soda of a known strength, which is allowed to drop, with constant stirring, into 1 oz. of the milk or whey, containing 2 or 3 drops of phenol phthalein, which acts as an indicator. The action of the caustic soda is to neutralise the acid in the milk or whey, and when this is done a faint permanent pink colour is apparent. The acidity test should be applied as soon as the morning's milk is added to that of the evening.

When the acidimeter records a rise of .02 over that obtained on the addition of the morning milk it is usually ready for renneting—*e.g.*, if the acidity of the mixed milk is .20 per cent., then the rennet may be added when the acidimeter reads .22 per cent.

RENNETING.

The rennet is added when the milk has attained the proper degree of acidity, and the quantity used when a standard commercial brand is employed is on an average 1 oz. to 20 gallons.

The rennet used must be above suspicion, free from turbidity or bad smell, and in storing it care should be taken to keep it in dark jars away from sunlight.

It is better to add the rennet too soon than too late. If added too soon, the time of coagulation will be prolonged, and the cheese will be slow; if added too late, a considerable amount of acidity will have formed in the milk, coagulation will take place in a short time, and the cheese will be too fast.

In adding the rennet to the milk it should be diluted with five to six times its volume of cold water, poured evenly over the surface and thoroughly mixed with the milk by stirring. Stirring for five minutes is usually sufficient, after which the vat should be covered with a clean white cloth, and the milk allowed to coagulate. Coagulation takes place in about forty minutes.

CUTTING THE CURD.

The curd is ready for cutting when it splits cleanly over the finger, or comes away clean from the side of the vat when the back of the hand is pressed on the curd surface. American knives are used, the curd being cut first with the vertical knife, lengthwise and crosswise, and then with the horizontal knife in the same manner. In cutting, the knives should be held perpendicularly; jarring and smashing

the curd at the end of each stroke is to be avoided, also overlapping the previous cutting. When properly cut the little cubes will be of a uniform size, and the whey will be of a pale-greenish colour. If the curd has been cut too soft, or if roughly handled, there will be a loss of fat in the whey, which will be of a white colour. The amount of fat in whey should not exceed 0.3 per cent,; with judicious treatment this may be reduced to 0.2 per cent.

An acidimeter reading should be taken as soon as the curd is cut, and this reading will usually be .13 to .14 per cent. If much higher, then most probably the cheese will be fast, consequently careful supervision will be required during the scalding process, and especially after it has settled in the whey.

When the cutting is completed, the curd is hand stirred until firm enough to allow the rake to be freely used. Hand stirring usually occupies about ten minutes.

Scalding or Cooking the Curd.

At this stage the scalding or cooking process commences, and by this is simply meant that the curd is slowly heated to a temperature higher than that of renneting. The object of scalding is to firm the curd and to simultaneously assist in the expulsion of moisture. The rate of heating and maximum temperature attained are points of utmost importance. The aim of the cheesemaker should be to reach the maximum temperature within an hour after the cutting of the curd, and to do this the temperature should be raised 1 degree in every 3 to 4 minutes. Moisture is more slowly expelled from the curd below a temperature of 90 degrees Fahr. than above, therefore heat slowly at first. The maximum temperature to scald should be 99 degrees Fahr. in summer and 101 degrees Fahr. in winter. It should be noted that some milks require a higher scald than others to secure the same degree of firmness.

The curd must be continuously stirred throughout the scalding process, care being taken to see that the particles do not mat or collect in the corners of the vat. Stirring is continued until the curd is ready to be settled or pitched.

Settling or Pitching the Curd.

When the particles become firm enough, the curd is pitched or settled in the whey. This stage can be estimated by taking a handful of curd, squeezing it in the hand, and if it shows little tendency to cohere it is ready for settling. At this stage the acidimeter reading is normally .15 per cent. to .16 per cent. If higher, the curd is coming on quickly and requires watching. The curd is now allowed to lie "cooking" in the bottom of the vat, until the requisite degree of acidity has developed, and this usually occupies about one hour. If much longer, the cheese is said to be slow.

Running the Whey.

This is one of the most critical steps in the whole process, for if the whey is run before the curd has developed the proper degree of acidity, too much moisture will be retained, and the cured cheese will probably go sour. The texture will tend to be soft and pasty, and the cheese may go out of shape in the curing room. When the whey is run off too late, although the flavour may be quite fair, the texture will be short and brittle.

The "hot-iron test" is the best method for ascertaining when to run the whey, but unfortunately it is not in general use. The testing iron is a flat bar of mild steel, about 20 in. long and 1 in. broad, fitted with a wooden handle. To make the test, a small portion of the curd is taken from the foot of the vat and firmly pressed for a few seconds in the hand to expel the whey. It is then applied to the iron, which has previously been heated to a dull black heat, until it adheres, and then gently withdrawn. The curd will draw into threads, if a certain degree of acidity has developed, the length and nature of those threads corresponding closely to the acidity of the curd.

When fine, silky threads, ¼ in. to ½ in. long, are observed, the whey is run. If the threads are shorter than this and very thick, it is an indication that the curd is still too sweet, and requires a longer time "cooking" in the whey. To conduct the hot-iron test properly, the iron must not be too hot nor too cold. A little practice will enable the cheesemaker to become proficient in the use of the hot-iron.

The acidimeter reading of the whey at this stage is from .23 per cent. to .25 per cent., and should always be taken to confirm the hot-iron test. The curd will now have contracted from the vat by about 3 in.

Where a large quantity of milk is being used, it is usual to run off some of the whey in advance. This in no way brings on the acidity, as is commonly believed, but is of advantage in large factories, especially if the cheese is fast.

CHEDDARING THE CURD.

As soon as the whey is run off, the curd is allowed to drain. If too moist, gentle hand-stirring for about three minutes is to be recommended, but there is a chance of loss of fat if this is done too vigorously. The curd when sufficiently dry should be evenly piled along the two sides of the vat, leaving an open channel down the centre to facilitate drainage. The vat at this stage should be tilted to allow the drainings to escape. Up to this stage the curd should not be allowed to become lumpy, the small pieces being as far as possible kept separate.

As soon as the curd has become matted, which takes place in about twenty minutes, it should be cut into blocks about 8 in. wide and turned over, the top going on the bottom. After draining about fifteen minutes the blocks are piled into layers two deep, each time the upper part being turned down. This is done every fifteen minutes until the operation is completed. Care should be taken to keep the curd well covered up, and not to allow the upper surfaces to become exposed to the air or to be chilled.

As a result of this cheddaring process, the curd develops a marked leafy or foliated texture—"it tears like meat on the breast of a chicken"; and this process is regarded as complete when (1) the curd forms strings on the hot-iron an inch to an inch and a-half in length, and (2) the whey running from the curd shows an acidity of from .70 to .90 per cent. The time occupied by the cheddaring process is usually from one and a-quarter to one and a-half hours, varying according to the development of acidity and texture of the curd mass.

MILLING THE CURD.

The objects of milling are to cut the curd into small pieces of uniform size, to facilitate salting, and to permit the escape of more whey. The curd at this stage should have lost all trace of harshness, being smooth and mellow. It also tears easily into thin strips. After milling, the curd is well stirred and freely exposed to the fresh air. At this stage an excellent opportunity is afforded for the escape of gases and undesirable flavours, and, after having been well stirred with the rake for about five minutes, it is brought together and allowed to lie until ready for salting.

SALTING THE CURD.

The hot-iron test is now 1½ in. to 1¾ in., and the threads are very fine and silky. The curd, when applied to the iron, smells like toasted cheese. When the salt is added the temperature is usually 78 degrees Fahr. to 80 degrees Fahr. Cheddars are salted at the rate of 1 lb. of salt to every 50 lb. of curd, but for a quick-ripening cheese rather less is required. In applying the salt, it should be sprinkled evenly over the curd, and the curd well stirred for ten minutes. Before hooping, fifteen to twenty minutes must be allowed to elapse for the curd to absorb the salt. The addition of salt to the curd reduces the temperature several degrees. The salt used must be clean, pure, readily soluble, and sharp in the grain. A very fine salt is not altogether desirable.

HOOPING AND PRESSING CURD.

Before filling the hoops, they should be well scalded and dried. Care is to be exercised in fixing the bandages, and to do this properly a certain amount of practice is necessary. A cotton cloth cap is wrung out in warm water and placed in the bottom of the hoop. The bandage is then put in the hoop, with the bottom edge turned in evenly about 1 in. The hoop is then filled with a weighed amount of curd, care being used to see that too much curd is not put in. A cap cloth is then placed on top of the curd, and then the ring and a wooden follower.

When the filled hoop is put in the gang-press in normal condition, a moderate pressure should be sufficient to cement the pieces of curd together in a smooth, solid body. The pressure should be applied lightly at first, gradually increasing until full pressure is reached in about half an hour. The pressure should be uniform and continuous for twenty-four hours.

DRESSING THE CHEESE.

When the curd has been in the press for about an hour, it should be in a fit state for dressing. The hoop is taken from the press and placed on a convenient dressing-bench. The bandage is now pulled up, made free from creases, and carefully cut to about an inch on each end with a knife. A well-starched cotton cap is now placed on each end, and over these a cotton cloth, the cheese being returned to the press under pressure.

On the following morning the hoop should again be removed from the press, and the cheese examined for any imperfections in bandaging and finish. These, if existing, should be remedied, and the cheese again returned to the press until the hoops are required for use again.

The object of pressing is to give shape, to press out any remaining whey, and to form a crust or rind. The acidity of the whey from the press is usually .95 per cent., but it may vary from .90 to 1.0 per cent. The amount of whey draining from the press depends on the moisture content and on the acidity of the curd. For Cheddars this should not generally exceed 4 lb. to 100 lb. curd. The fat percentage of the press whey should not exceed 3 per cent. The temperature of the press room should be about 70 degrees to 75 degrees Fahr. if possible.

CURING THE CHEESE.

It has been well said that the cheese is only half made when taken to the curing-room. On the management of the cheese during curing will depend to a large extent the quality of the finished article. The curing-room must be capacious, well ventilated, and free from dampness, otherwise moulds will cause trouble, and the cheese will be liable to sweat.

The temperature of the curing-room should be maintained between 55 degrees Fahr. and 60 degrees Fahr. At temperatures exceeding 60 degrees Fahr. the quality of the best cheese is impaired, and there is an undue loss by evaporation, with a resultant dryness of body. If the air is very dry and the cheese "full acid," the rind sometimes cracks, thereby still further increasing the evaporation from the interior of the cheese. At low temperatures, although the curing process is slower, the quality of the cheese remains good, and there is considerably less shrinkage.

The humidity of the curing-room is another important factor, and should receive careful attention. If the air in the room is too dry, the evaporation will be greatly increased, and the body of the cheese will thus become too hard and firm. On the other hand, if too damp, the intervention of mould growth is practically certain. An effort should be made to maintain the humidity of the air of the curing-room at 80 per cent. of the saturation point, as measured by the wet and dry bulb thermometer.

Cheese should be turned daily in the curing-room for at least six weeks, and every second day thereafter until ready for sale. Most factories are fitted with turning dales, which render this an easy task. Cheese should not be sold until ripe. The marketing of half-ripened cheese is detrimental both to the producer's interests and to the consumer's digestion. It should be ripened for at least three months before consumption.

NEW ZEALAND DAIRYING.

We have received from the Secretary of the Waikato Winter Show Association, Hamilton, Mr. W. H. Paul, the prize list for the fourteenth annual show of the Association, with which are incorporated some highly interesting statistics showing the remarkable development of the industries of the Dominion and of dairying in particular. The record of that industry, the result of co-operation and the assistance of science, is well described as "romantic development." We (in Queensland) have also made immense strides in all the phases of the dairying business, and the following short history of the progress made in New Zealand cannot but have an inspiring effect on all engaged in the further development of our dairy herds and on the methods of dealing with dairy products from the bail to the foreign markets:—

"If the real history of New Zealand's dairying industry were written, it would read like a wonderful romance. We have been accustomed to believe that our gold-mining held the only elements of literary interest, and indeed the old alluvial days were filled with the fascination of adventure, of strange happenings, striking incidents, of good luck and ill luck. Fortunes were made and fortunes were lost in those wild days, and even in the latter times of quartz-mining there was much to stir the imagination and to supply the stories that thrill the mind.

"But neither the rifling of the golden stores from Otago river-beds and West Coast beaches, nor the colossal treasures won from such reefs as the Caledonian or the Shotover have had such widespread influence on New Zealand material development, or have wrought such striking changes in New Zealand's landscapes as dairying. The old Israelites found a land flowing with milk and honey. New Zealanders, within a mere handful of years, have made the empty wilderness produce veritable rivers of

milk, mountains of butter and cheese, and more honey, too, than ever the patriarchs found in that ancient land of promise.

"Goldmining devastated the country which yielded the greatest riches; its rewards were carried to other fields. Dairying has covered wide districts with beautiful farms and snug homesteads; its rewards have been spread among all who would work patiently and intelligently. Goldmining exhausted its sources of wealth the more energetically it was carried on; dairying increases its rewards the more intensively it is pursued and the longer it is followed.

"In 1888 New Zealand exported 2,995 cwt. of butter and 36,682 cwt. of cheese; in 1898 the exports were 96,601 cwt. of butter and 68,711 cwt. of cheese. It was practically in 1898, or only twenty years ago, that New Zealand's dairying industry commenced. By 1908 the exports of butter had leaped up to 229,971 cwt., and cheese had risen to 211,242 cwt. In 1918 they had lifted to 384,009 cwt. of butter and 914,100 cwt. of cheese.

"These are marvellous increases, but the advances in value were still more marked. In 1888 the total exports of dairy produce from New Zealand were valued at £200,000. In 1898 the value of butter exported was £403,690; of cheese £783,419. In 1918 the value of butter exports had reached £3,050,862, and cheese had reached £4,207,647.

"It is impossible to give an adequate comparison of the increase in values per cwt. during recent years, because war conditions have dominated market prices. In 1908 the price of prime quality New Zealand butter on the London market was 115s. 3d. per cwt., and it varied from 109s. 1d. per cwt. in 1909 to 125s. 8d. in 1912. At the beginning of the war in 1914 the average price was 116s. 3d. The average wholesale price of New Zealand butter in London during 1918 was 252s., and through the present year the average has been 248s. 5d. Cheese has been subject to just about the same fluctuations. In 1908, it was 62s. 1d., and it ranged from 58s. 9d. in 1911 to 66s. in 1914. In 1918 it averaged 130s. 8d.; during the present year it has been 155s. 4d.

"But these values do not represent the true rise; they merely show the commonplace quotations in a market, fixed and set by the law of demand and supply. The real romance of values commenced in the middle eighties, when the dairy farmers in New Zealand were selling their milk to the proprietors of private dairy factories at 2¼d. and 2½d. per gallon, irrespective of butter-fat contents. Milk from a well-bred Jersey, yielding 5 lb. and even up to 7 lb. of butter-fat per 100 lb., was paid for at the same rate as milk which gave only 1 lb. of butter-fat to the 100 lb. of milk. And dairying began to flourish, even under these conditions, because they were good compared with what had been.

"Previous to the introduction of the dairy factory and the export trade in New Zealand, the common price for farmers' butter was about 4d. per lb., and there was little demand for it; it was used more as a means of barter with the storekeeper than as a marketable product. The price of 2¼d. and 2½d. per gallon of milk, offered by the old dairy factories, meant more than 6d. and 7d. for butter, and there was none of the labour and risk of private manufacture. No wonder the dairy farmers twenty years ago welcomed the advent of the dairy factories; they meant more than a big increase in the value of milk; they meant an almost unlimited demand. Hitherto the output of the New Zealand dairy farm had been curtailed by the smallness of the local market; now the markets of the world were opened, and butter-fat has marched up to 1s. 6d., and even 2s. per lb.

"The romance of New Zealand's dairying industry has its origin in the brains of those scientists and mechanics who worked out the practical application of refrigeration to the preservation of foodstuffs. Such men are not usually credited with the possession of romantic capabilities, and could have no more idea of the effects of their discoveries on New Zealand than Tasman or Cook had when they first made these islands known to the world; but what marvellous results have accrued from their labours!

"Refrigeration has opened illimitable fields to industry. It has brought spring lamb from New Zealand to the winter dinners of Englishmen. It has spread the toast of Lancashire operatives with butter churned in the Waikato, and it has done more than this; it has played a dominant part in the manufacture of all dairying products. The modern factory manager in New Zealand no longer is at the mercy of varying temperatures; he can control them. His freezing plant has made him master of ferments and bacteria. Dairying in New Zealand has risen from a crude industry, where the farm churn was governed by a boy's whistle and the week's butter might be spoiled by a thunderstorm, to an organised science under which the weather has absolutely no power and quality is a matter of calculation.

"It is no exaggeration to say that no country in the world has witnessed so rapid and great development in the output of dairying products as New Zealand, and it is equally true to say that no other country has seen such a wonderful advance in the scientific and mechanical details of manufacture. The manager of a New Zealand butter or cheese factory must be a master of special chemistry; a single mistake of his might mean the loss of thousands of pounds, and on his skill depends the quality of material worth tens of thousands.

"New Zealand has probably the largest and best-equipped butter and cheese factories in the world, and her dairy farmers use more separators and milking machines than any others. Denmark is a great dairying country, and her people have long led the way in all the arts of butter and cheese making; but New Zealand, with all its drawbacks of distance from markets and its lateness in starting, has more than caught up with its greatest rival. In some things it has gone ahead, and New Zealanders say they have only just commenced dairying, and that the real development of this industry lies in the future.

"It is not only in mechanical and scientific development and the magnitude of its dairying output that New Zealanders have shown their energy and ability. It is in co-operative and financial organisation that they have achieved some of their greatest results. The old privately owned dairy factories have almost universally given way to the co-operative business, in which the milk-suppliers are the chief and, in most cases, the only shareholders. These associations are conducted, of course, entirely in the interests of the dairy farmers. Every economy effected, every improvement made in the handling of milk or cream and its manufacture into butter and cheese, benefits the farmers; and they go further than this, for some of these companies purchase fertilisers, implements, machinery, and other goods for their members, and even advance money for stock and such like things. They provide instructors who advise new farmers in the ways of handling dairy cows, growing fodder crops, and, of course, in the ways of increasing and improving milk-production.

"Of late years there has been a tendency for these individual factories to co-operate and even for co-operative associations to amalgamate. Striking instances of this development have taken place in the Auckland province, where the dairying industry has expanded remarkably.

"The New Zealand Dairy Association was formed in 1901 to handle the business on a co-operative basis which had previously been carried on by Messrs. Lovell and Spragg. As a co-operative concern under the management of Mr. Wesley Spragg and a board of directors its growth was phenomenal. Prior to its flotation as a co-operative company, its output of butter was 1,200 tons per year. Under the new arrangement it soon became a very large concern, having 3,500 milk-suppliers and manufacturing 6,000 tons of butter and 1,000 tons of cheese per year, whilst its annual sales amounted in value to nearly £1,500,000.

"Recently the New Zealand Co-operative Dairy Association amalgamated with the Waikato Co-operative Dairy Company, another company with a marvellous history. This Waikato Co-operative Dairy Company, under the management of Mr. W. Goodfellow, began in 1909-10 with an output of 150 tons of butter and a turnover of £15,000. In 1913-14 the output was 1,100 tons of butter and the turnover £125,000. In 1918-19 the output was 1,000 tons of butter and 2,250 tons of cheese and the turnover £600,000.

"The new amalgamation is known as the New Zealand Co-operative Dairy Company, Ltd., with its headquarters at Hamilton, Waikato, and is the largest co-operative company in the world. The new company will have 5,000 suppliers, and will receive the product of about 100,000 cows. It has eight butter factories, 10 cheese factories, 3 dried-milk factories, 16 cream factories, and a large number of creameries. The output of butter this season is estimated at 8,500 tons, of cheese 2,000 tons, dried milk 2,000 tons, and casein 300 tons, whilst the value of the turnover will be approximately £2,500,000. For a country with so small a population and so short a history the growth of such organisations is in itself a romance."

The Waikato Farmers' Co-operative Auctioneering Company, Limited, furnishes us with another example of the great value of co-operation amongst farmers, which we hope to see more largely and beneficially extended in our own State as time goes on.

The Waikato Farmers' Union began its career in a very modest manner. We are told that: "In the year 1906 a few Farmers' Union enthusiasts got together, and the first meeting to discuss any concrete proposal was convened on 7th July of that year by Messrs. Joseph Barugh and H. S. Hawkins, the present chairman and vice-

chairman of directors respectively. It was taken up by the Hamilton branch of the Farmers' Union, and subsequently a most enthusiastic meeting was held on 15th August, 1906. This meeting led to the appointment of an executive to go fully into the matter and endeavour to bring into being a co-operative company run in the sole interests of the farmers. The result of this committee's labours was eminently satisfactory, as the old-established firm of Messrs. McNicol and Co.—who, by the way, had been operating as stock and commission agents throughout the Waikato—was acquired on more than reasonable terms, and the present company was incorporated under the Companies' Act on 5th April, 1907. From that date the Farmers' Co-operative Auctioneering Company, Limited, has never looked back. It was commenced with 735 shareholders, and to-day the number is 4,500. At the end of the company's first financial year the paid-up capital amounted to £44,730, and the uncalled capital £5,355. To-day the paid-up capital stands at well over £400,000 and the uncalled at approximately £75,000. In 1908 the permanent staff numbered 13; now over 200 permanent employees have been found necessary to carry on the firm's business. As year has followed year the auction sales have increased beyond expectations. Whereas in 1908 they numbered 150 per year, at present the figures have reached the 800 mark. This year a record has been established as far as the turnover is concerned. At the end of the financial year 1919 the figures were £2,149,432. To-day the turnover has reached the large sum of £2,500,000—an increase of 350,568. At 31st January, 1910 (three years after the start of the company), the total liabilities were £57,482, while the assets stood at £123,736. It will thus be seen that the percentage of liabilities to assets (excluding uncalled capital) was 46.45 per cent. The figures at the end of the last financial year were: Total liabilities £230,806, assets £588,637; percentage of liabilities over assets (excluding uncalled capital) 39.21 per cent. At 31st January, 1919, the reserves of the company totalled £51,534 18s. 11d., the nominal capital being £750,000. During the time the company has been in existence no less a sum than over £231,000 has been paid to shareholders by way of rebates and dividends, and practically the whole of this money has been distributed to the farming community in the districts in which the company is operating."

GROWTH OF TREES.

In our article on "Forestry," which appeared in the issue of this journal for January, 1920, we gave instances of the diametric growth of some varieties of timber trees.

Later, Mr. Swain, Acting Director of Forests, in an interview with a "Courier" representative on the subject of the rate of growth of trees, admitted the importance of the subject, as on the growth of timber largely depended the financial position of forestry departments. In Europe, where the winter and summer seasons were strongly defined, Mr. Swain said, annual rings were made on trees, and thus it was easy to determine their ages, but there were no such clear markings in Australia, and the forester here had adopted the plot system of calculation. Sample plots of trees were measured to ascertain the rate of growth in the forests. Rather than measure the seedling tree, however, till it had attained maturity, the forester took the diameter of trees every few years, and determined the rate of growth of species in the forest, roughly, in that way. In the Pilliga Forest, in New South Wales, by this method it had been ascertained that it took 125 years for a cypress pine to mature, while in the Warialda district similar trees came to maturity in seventy-five years. Mr. Swain pointed out that many factors entered into the determination of the rate of growth. These records in the mother State were made in drought periods, and it had been found that in good years the rate of growth was more rapid than the drought record indicated. Then the matter of congestion in the forest had a lot to do with the progress of the tree, and when forests were thinned out growth naturally became much more rapid. Red and white cedars in Queensland were very rapid growers. In the seedling stage these trees might grow to 7 or 8 ft. in the first year, while hoop pine might grow only a few feet or inches. Cedars, however, were liable to be cut back by droughts and frosts, whilst pine was hardier, and in course of time might make better all-round growth than the cedars. Silky oak was another fast-growing Queensland tree. One of the best results obtained on Fraser Island was in the case of the red stringy bark tree, a seedling of which reached a height of 45 ft. in three years. Blackbutts attained to 40 ft. in a similar period, while cypress pine, a smaller tree, averaged from 8 ft. to 11 ft. Mr. Swain mentioned the very interesting fact that Australian trees taken to other countries had made a more rapid growth in those countries than such trees had averaged in Australia, whilst trees brought from America to Australia grew more rapidly than they had been accustomed to do in their native haunts.

The Horse.

A NEW DRAUGHT ANIMAL.

[A Zululand farmer has been crossing a jack donkey with a zebra mare, which, as a result, has recently given birth to a foal. The following article shows what the U.S.A. Government has been doing in a similar direction.—ED.]

For thousands of years the horse, the ox, and the mule have been used in agriculture and other operations requiring haulage power. Of late years the tractor has become their rival. Now, through the agency of the U.S.A. Government, a new and powerful animal is being brought into use—an animal more hardy than the horse and more beautiful; and, it is said, possessing a greater intelligence and much greater docility.

For generations the so-called Rocky Mountain canary, or burro mule, has been famed in the States as the slowest, the dullest, sleepiest, and at times the most stubborn of brutes. Those who have traversed the Rockies know the "canary." They carry many a memory of mountain passes perilous to life, where the burros, hardly moving at their wildest moments of hurry, have deliberately stopped, and refused to move except backwards to the extreme edge of the canyon. They can only recall the "canary" as the worst of animals that ever carries a load on its back, and none has a respect for it. Now the U.S.A. Agricultural Bureau has placed it in the position of being the parent of a new and wonderful animal of great use.

A ZEBRA SIRE.

Ever since the zebra became known attempts to domesticate it have proved useless. The temper of it makes it practically untameable. It has been crossed at times, but such crossings have resulted in animals of no value at all, though of great beauty. The intractability of the zebra has ever remained. Some years ago the U.S.A. Government decided to put the matter on a scientific basis. It was resolved to cross the zebra with an animal so lethargic, so docile, that the fiery, savage nature of the zebra would be reduced to the minimum, and in the burro of the Rocky Mountains that animal was found. A Grevy zebra, the largest of the species, the most vicious and untameable, was taken as the sire, and a "canary" became the dam, and the new breed was at last raised scientifically at the Government experimental farms at Peltsville, near Washington. That was some ten years ago. To-day the new animal is not only to be seen in circuses and zoological gardens in the United States of America, but is also being used on the land with immense success.

THE "HYNEY" DESCRIBED.

It is believed that it—up to the present no name has been coined for the new species other than that of the hyney—will quickly become a rival of the horse for work, for driving, and for riding. The animal has much harder muscles than the horse, and has all the mule's capacity and endurance for work, and is easily fed. Docile, easily trained, pretty of body, and trim in outline, the hyney is more beautiful than the horse, and more tractable, too. The colts are easily broken to halter and to harness. The colour has changed from the grey-white of the zebra to the darker hue of the mule, though the stripes of the zebra remain, and the remarkable fiery eye of the latter is there, still one of high intelligence, but with more amiability. Practically every physical attribute of the zebra—one of the most perfect and beautiful animals known—remains; yet its terrible temper and nervousness have been counteracted by the mule's proverbial stolidity and sluggishness. The hyney has all the fleetness of the zebra and an extraordinary strength of physique in health and digestibility; while its power of haulage exceeds that of the average horse. So it may be that in years to come, when the hyney has become popularised, one will see a hyney team ploughing instead of Dobbin and his mates.—"South African Farmers' Advocate."

The Orchard.

SPANISH SYSTEM OF GROWING ORANGE TREES.

In the second edition of Mr. A. H. Benson's work on "Citrus Culture," he mentions "collar rot" and the remedy for this disease. He also states that, if an orange tree is planted on badly-drained clayey soil, no treatment will prevent or cure collar rot.

The Government Viticulturist of Victoria (Mr. F. de Castella) (1909), writing in the February number of the "Journal of Agriculture" of that State on "The Orange in Eastern Spain," describes a remarkable method adopted in that country for the prevention of collar rot. He says:—

"The most remarkable peculiarity in connection with the cultivation of citrus fruits in the Levante is the system of growing the trees over a hole, with the collar and starting point of the main roots exposed to the air. This system is very generally followed. It was at the Granja Valenciana (experimental station and school at Valencia) that I first remarked this curious method, but all the orange trees which I saw subsequently were treated in the same way. The photograph shows this very

clearly. The tree is reared, budded, and planted in the usual way, and until about three or four years old is treated much as we would do in Victoria. By this time its surface roots have become sufficiently strong to support it; a hole is dug underneath it, and the tap root is entirely cut off with a saw.

"The hole, which is a foot or so in diameter, and of about the same depth, is not filled up. It remains always open, any dirt or rubbish which may fall into it being regularly removed. When irrigating, which is usually done by flooding, a small dam is made around the tree at a distance of a couple of feet from it, to prevent water getting into the hole. The appearance of these trees is very striking; their bases may be compared to large spiders sitting over holes in the ground. The object of the treatment is to prevent collar rot and gumming (Mal de Goma), which used to be prevalent, but now seems to give little trouble. The sour orange stock is the one usually employed, even for lemons; lemons worked on lemon stock are said to be liable to Mal de Goma. The trees struck me as being very healthy. They were loaded with an abundant crop of fine fruit; in fact, everything seemed satisfactory excepting the price."

ERADICATING FRUIT PESTS.

An important discovery of a method of destroying fruit pests was received from Sydney on the 29th March last by the "Brisbane Courier" to the following effect:—

"The expensive and tedious process of eradicating fruit pests by means of the spray pump and fumigating plant, involving ceaseless toil and eternal vigilance, may, as a result of experiments now being carried out in New South Wales, soon be eliminated from the orchard equipment. A totally new method of coping with fruit pests has been devised, and, although it has by no means travelled beyond the experimental stage, from evidence already available it holds out a strong probability that a simpler, more effective, and less expensive treatment is in sight. In contrast with the drawbacks associated with spraying and fumigating, the new treatment aims at combining with natural forces to carry out the remedial work, and uses the sap circulation to convey the insecticide. By boring a hole, say, half an inch in diameter, and 3 in. to 4 in. deep, in the trunk of the infested tree and inserting a suitable quantity of a specific, which is not itself a human poison, in forty-eight hours there are evidences that the sap, even to the terminal tips of the branches, has been affected. In a few weeks the parasites are killed without apparently checking the health or bearing capacity of the tree. There is every reason for thinking that the discovery holds far-reaching possibilities."

STRAWBERRY INSECTS AND DISEASES.

THE CROWN BEETLE.

A strawberry-grower in Western Australia writes, in an article to a W.A. journal, that strawberry-growers in that State are worried this season, more than ever, with that persistent pest, the Crown Borer or White Grub. Twenty years ago it threatened the plantations in Tasmania, where strawberries are largely grown for the jam factories. In Western Australia the fruit is grown for the table, and the method of doing this helps considerably to get rid of this pest, as they are grown in drills. After the runners have been removed, and the beds cleaned up, remove as much foliage as possible, stripping right to the crown. This should be done just previous to blossoming. Lay baits of parsnip cut in half, and sprinkle thereon Paris green and flour in equal quantities. Place these baits under pieces of old bagging or boards to prevent drying. The writer further stated that he found this to be the most effective remedy.

Mr. W. French described and illustrated the weevil in an article on strawberry-growing in his "Handbook of the Destructive Insects of Victoria" in 1893, and also in this journal in August, 1908, and said that, to the best of his belief, Australia was free from it. It appears, however, that the pest is in strong evidence to-day, both in Victoria and in Western Australia. The remedy he suggested is to burn over the field after the fruit is picked, when, if the insects are not destroyed, the plants should be dug up and burnt. For the strawberry-leaf blight, rust, or sunburn, indicated by small purple or red spots appearing on the leaves, and eventually becoming larger, making the leaf appear blotched, Mr. French advised spraying with Bordeaux mixture at intervals of two weeks as soon as the fruit is picked. The leaves are easily destroyed without injury to the plants by quickly burning off a thin layer of straw which is spread over the patch after the fruit is off. When farmyard manure cannot be obtained, a good dressing consists of 3 cwt. of bone-dust, 3 cwt. superphosphate, 1 cwt. dried blood, 1½ cwt. sulphate of ammonia, 2 cwt. sulphate of potash per acre, or in these proportions for smaller areas.

PLANTING THE STRAWBERRY.

It is impossible to fix a hard-and-fast time to transplant, as the seasons differ so much in different localities, but, if the ground is in good order, and the weather showery, a start may be made as early as 1st March, or later in some districts. For garden culture, the runners may be planted in rows, 18 in. apart, and at a distance of 12 in. between the plants, and when one crop is done, the plants may be dug in, the ground well manured and got ready for planting the following March. For field planting, the distance between the rows should be 3 ft., and the plants 1 ft. apart. The roots must be placed in the most natural position possible, and the soil well pressed down upon them, the collar of the plants being just level with the surface of the ground. This is of vital importance. Planting the plants and just sticking the roots under the soil are two very different matters.

MULCHING.

Forest oak makes a capital mulch. Failing that, half-decomposed leaves will keep the fruit clean from grit, and also makes a good humus.

Tropical Industries.

THE SUGAR DISTRICTS OF SOUTHERN QUEENSLAND.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant (Mr. J. C. Murray):—

Throughout the month the districts of Nambour, Bundaberg (which includes Woongarra, Barolin, Millbank, Gooburrum, and Sharon), and the inlying areas between the Maroochy River and Tiaro have been visited.

NAMBOUR.—This district, including the Maroochy River, looks very well, considering the weather conditions of the last twelve months.

The cane presents a green and growing appearance and the farms for the most part present a clean aspect. The autumn and spring plant cane is not quite as forward as this time in past years, the 1919 drought not only interfering with efficient planting, but it also seriously affected the subsequent cultivation, and, in case of ratoon crops, ratooning.

There is no reason to anticipate, in these districts, anything in the nature of a failure in the sugar crop, and, although the harvest will not be a large one, fair returns are to be expected.

With regard to varieties, the Q.813, 285, Gingila, and D.1135 are growing well. N.G. 16 is doing well in places, though it is doubtful if the cane is worth planting in the Nambour district. Q.813 is a variety that is coming into favour, being a cane that apparently does well on a great variety of soils, ratoons and stands over fairly well, and is, in addition, on account of the growth of the top, a cane that protects itself from the sun's rays to a large extent.

A notable feature with regard to cane-growing here is a new piece of land that has been reclaimed from the scrub recently by Mr. Bowder, of Yandina, and planted with cane, about 50 acres in all. This land for a long time has lain idle, and was regarded by many as more or less unsuitable, but by the way the cane is striking, and the general appearance of the plantation, much credit lies with the owner. The soil on this place, which lies in between Yandina and Nambour, is a light forest loam, cultivating and draining well. D.1135 is the principal cane growing.

WOONGARRA-BAROLIN.—The cane on the areas is having a hard struggle to grow. Not nearly enough rain has fallen, and most of the plant cane for the time being is making very poor headway. This is bad luck for the farmers in these parts because the greater part of the November planting struck very well, and would have been making a fine showing by this time had good weather prevailed. The last autumn plant cane is, however, very backward, and on some farms the growers will be lucky if they get anything out of it at all. It is unlikely there will be much to cut here this year, and unless plentiful rains prevail in the next six months the prospects will not be too bright for 1921.

As against this, however, must be taken into consideration the richness and fertility of these soils and the remarkable manner in which the farmers have combated noxious weed development. These factors all contribute towards rapid growth if rain falls, and it is difficult to find land in the State more suitable for sugar cane growing, provided the farmers are only blessed with an average amount of rain. As mentioned in previous reports on these areas, the D.1135 appears all round to be the most suitable variety. It is probable, though, that if Q.813 were taken and tried thoroughly it would give satisfactory results. Q.285 is a cane that ought to grow on the heavier soils of the river banks.

Qunaba Plantation has a fair amount of Badila planted, also a fair quantity of cowpea for green manuring purposes, but the disheartening results of the loss of the rainy season make it difficult to comment on the growth of the New Guinea cane.

MILLBANK.—There is very little to add since my last report on Millbank. The farmers are busy cultivating their cane, and keeping down noxious weeds, particularly nut grass. The spring planting has struck very well, but not much growth is in evidence just at present. The ratoon cane is green and healthy looking, and generally speaking this riverside area has held out better than the uplands.

Lime is essential, as evidenced by repeated tests taken; also analyses show marked shortages of potash. Farmers require to be alive to the value of having their soil tested, as often much trouble and expense is saved.

Green manuring would greatly add to the fertility of these lands, as well as increase their drought-resisting qualities. Increased alkalinity would also result, which, as mentioned before, is badly needed.

GOOBURRUM.—The cane probably looks more vigorous in this area than any other around Bundaberg.

Seepage is not heavy on these farms; consequently more subsurface moisture prevails than commonly occurs on surrounding areas. Ploughing preparatory to planting is proceeding, though the farmers may hold off for a time to see how the weather is. If they plant now, though, there is no reason to anticipate not getting a strike, as the soil underneath is fairly moist. Noxious grasses are well in hand, and, as far as can be observed, very little trouble is being experienced with cane pests.

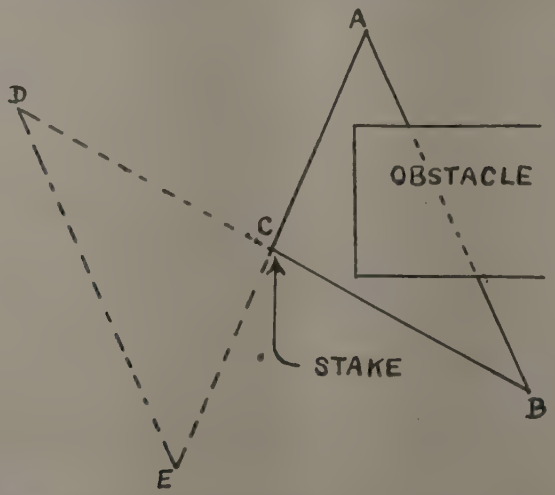
SHARON.—The farms in this district are, of course, suffering from want of water, but, generally speaking, the growers appear to be optimistic. The spring planting has struck well, with a very small percentage of misses, and the autumn planting and first ratoon cane looks green and hardy. Planting was in progress on some of the holdings, principally Demerara 1135, the soil working up to a good surface condition. Some parts of the land, however, show marked shortages of potash, phosphoric acid, and nitrogen. Fungoid parasites and grubs are not frequently met with, although noxious weed growth is considerable. More intensive cultivation would materially assist growth and minimise the effect of the dry weather.

With regard to cane growing between Tiaro and Yandina, there is very little done at present. At such places as Cooran, Eumundi, and Cooroy, a few farmers have cane in, but are not seriously studying the industry, finding other pursuits more profitable.

There is plenty of good cane land in these areas, but farmers consider at present that incidental expense, including transport and milling, is too much against them.

MEASURING INACCESSIBLE DISTANCES.

One of the simplest methods of measuring the distance between two points when an obstacle prevents a tape-line being stretched between is as follows:—To measure from A to B, put in a stake at C, so that the lines CA and CB clear the obstacle. Measure from C to A, then swing round the tape-line and get a point E in line with



C and A, and with the distance CE equal to CA. In a similar way, get the point D in line with C and B, and with the distance CD equal to CB. The length from D to E will be equal to the length from A to B.

Horticulture.

IMPRESSIONS OF SOUTHERN PARKS AND GARDENS.

Address by Mr. E. W. BICK, Director, Botanic Gardens, at the Horticultural Society's Show, 20th April, 1920.

Having gone through to Adelaide and stayed on my return journey at the various places to be mentioned later, I propose to deal with Adelaide first. For the benefit of those who have not had the privilege of visiting this beautiful city, I desire to furnish a few facts as to the foundation and lay-out of the wonderful capital of South Australia. The site was selected and the city designed by Colonel Wm. Light, first Surveyor-General of the State. The city proper is one mile square; on the four sides are four terraces—North, South, East, and West. Outside these are park lands half a mile in width; adjoining are the suburban areas. Inside the city are six squares, with an average area of about 4½ acres, nice little green patches of turf and trees intersected by paths, and in prominent positions statues of notable personages. One of the squares is called the "Light," in honour of the designer of the city. What a difference might have been in our City of Brisbane had the same kind of "Light" been available at its foundation! None of the park lands can be built upon except for public purposes. From the Railway Station, at the western end of North Terrace, fringing the park lands, are Parliament House, Government House, university, school of mines, art gallery, public library, museum, and hospital; and botanic gardens at Eastern end. The park lands under the control of the Municipal Council total 1,900 acres, and include numerous small parks and gardens, three large public gardens, and eleven principal parks. Of the latter, the Adelaide Cricket Oval and the Victoria Park Racecourse are revenue-producing. The street gardens along North Terrace are well kept, and good displays of flowering plants are made in season. The deciduous trees of the streets—planes, elms, oaks, &c., were in glorious new leaf, affording fine shade. The English elm, owing to its pronounced suckering habit, is becoming somewhat out of favour, but the kurrajong is very largely used as a street and park tree. I was rather surprised to see *Lagunaria patersoni*, a Queensland tree, closely related to the hibiscus, has also been freely planted. Avenues of plane trees at their best look remarkably well, and *Grevillea robusta* lining a street showed Queensland represented again. At the Botanic Gardens Mr. Bailey gave me every facility to see his beautiful gardens, and also enabled me to enrich our collection of plants. I envied him his water supply and some of the gifts that show such a fine public spirit and interest. Why is it that Brisbane is so badly off for bequests? Is it that our moneyed people go South or elsewhere to spend what they draw from Queensland? In Adelaide thousands of pounds have been given for public purposes. In the Gardens the kiosk was a gift, as well as a new bushhouse, a large fountain, statuary, &c., whilst about the city are numerous instances of benefactions. In Ballarat it is the same, some very notable marble statuary, with building to house it, may be seen in the Gardens, while other evidences are prominent in the streets. At Geelong the same good public spirit is brought to one's mind, whilst in Melbourne and Sydney evidences of the same spirit of generosity by donors are frequently to be met with. The Adelaide Gardens, owing to the cold winters experienced, are well equipped with glass houses, there being about a dozen, besides the palm house with dome rising to between 30 and 40 feet high, and the Victoria regia house, built specially to grow this unique waterlily. In the show houses, fine displays of flowering plants are made in season, with gloxinias, streptocarpus, pelargoniums, both regal and zonals, cinerarias, primulas, &c., ornamental plants such as rex begonias (a very fine collection). Caladiums, crotons, and anthuriums made a fine show, as also did a good collection of bromeliace, comprising æchmea's, billbergia's, nidularium's, and tillandsia's. Ferns, too, are well represented. Quite a lot of bedding out is done, and fine displays made with chrysanthemums, cinerarias, carnations, and all kinds of annuals. There is also a very good rose garden, well laid out, and a fine collection; climbers are chiefly grown on separate pyramids. I was in time to see quite a good lot of bloom, particularly the wichurianas and polyanthas. Mr. Bailey informed me that they get better roses than we do in Brisbane, but our flowering season was much longer. The better roses are owing to the cold of winter ripening the wood before pruning; the shorter flowering season is owing chiefly to the hot winds that sweep over the Adelaide plains. The Gardens are well off for ponds or lakes, one specially formed for nymphaes has the finest collection in Australia. I have forgotten the exact number—about 130—in all colours. A large lake, home of numerous waterfowl,

with island near kiosk, is margined with Calla æthiopica (lily of the Nile). At the time of my visit they were in full flower with fine effect. Large collections of neriums, magnolias, syringas (lilac) are grown, also many fine flowering shrubs. Trees are also well represented, a fine specimen of *Stenocarpus sinuatus* (wheel of fire) is very prominent. Another fine feature is the class grounds, in which plants are grown in natural orders, from ranunculaceæ to graminæ. This is specially for students, and it is a very important and interesting phase of botanic gardens work. The Botanic Park, next to the Gardens, has been thickly planted with trees, the roadway running parallel with garden fence having a splendid avenue of planes. They have grown together at top and sides, and, looking along the centre of the roadway, it forms a beautiful, long tunnel of green, and is a favourite motor drive. The park extends to the Torrens River. Another important branch of the Gardens is the type orchard at Mylor. This is situated on the Mount Lofty Range, within easy distance of the city. Mr. Bailey is keen on this work, and they have about 1,400 kinds of apples, about half that number of pears, and full collections of apricots, plums, persimmons, almonds, Barcelona nuts, English gooseberries, currants, and raspberries. In the fruit season displays of fruit are made in the Botanic Museum at the Gardens—150 kinds of apples, for instance. This creates great interest, and is of practical use, as it shows fruitgrowers the kinds to plant and those to avoid. There is a large amount of land available in the hill country suitable for the fruits I have mentioned, and at the time of my visit the cherry season was in full swing, large quantities being grown. The well-known ornithologist, Captain S. A. White, with his motor car, gave Mr. Bailey and me some glorious trips to see some of the hill gardens; there may be seen gorgeous rhododendrons—they were just at their best—large masses of flowers of all shades of colour—and also azaleas, including the mollis type of deciduous kinds, that require a colder climate than ours to thrive in, many having tones of yellow and orange colours so distinct from the *A. indica* type we are familiar with. Fine collections of Japanese maples, with beautiful tinted foliage, were at their best, and large collections of conifers in fine healthy growth with numerous golden kinds were seen; in fact, nearly all the conifers, from the gigantic wellingtonias and pines to the small junipers, may be seen growing luxuriantly. Beautiful tinted copper beech trees and silver and other birches add their quota to the fascinating scene. Foxgloves, too, do remarkably well—fine strong stems of flowers over 4 ft. high, in delightful colours, self-sown in many instances, grow in profusion.

I enjoyed every moment of my visit to the hill gardens, the old beautiful home and grounds of the late Sir Edward Stirling, with its wonderful collection of rhododendrons and other plants I have mentioned, and Mr. F. H. Snow's garden (a newer place), with a fine collection of plants, had, in addition to those spoken of, a very good lot of delphiniums in flower. We were very fortunate in seeing these gardens under such conditions, and I am very grateful to Miss Stirling, who kindly acted as guide through their grounds, and to Mr. Snow's gardener, who acted in a similar capacity in his.

I am afraid if we do not soon leave Adelaide I shall keep you here all night, if I speak of the other gardens.

Leaving my good friends in Adelaide at 4 p.m. per mail train, I arrived at Ballarat next a.m. for breakfast. The street gardens here are well kept, and, at the time of my visit, gay with flowers. The trees, also, in the streets, are a fine feature. A tram ride through the city and for some distance round the shores of Lake Wendouree, brings one to the very fine Botanic Gardens. Mr. Toop, the curator, specialises in floral displays under glass of tuberous-rooted begonias (finest in Australia) which would be worth going to see when in flower. Unfortunately I was too early, but the show of calceolarias were of the finest type procurable, some of the flowers of which were 4 in. across. It was an eye-opener to me—just a glass-house full of them. It was a wonderful sight. The schizanthus, also a fine type grown in pots, bushy plants about 2 ft. through, bore very large flowers of lovely hues. Another house of pelargoniums, with flowers even surpassing the boomed illustrations we see occasionally in catalogues, made a fine display. A very good collection of orchids occupied another house. In a sheltered corner masses of rhododendrons were a feast of gorgeous colourings. Mention has already been made of the beautiful statuary. In addition to these there are a number of classical pieces about in the Gardens, also gifts. Roses do well here and were flowering freely. There are also fine examples of conifers. A red flowering, or, as it is called, the "Waratah," everlasting pea, a robust grower, with large clusters of bright red flowers, has a very fine effect when in full bloom, as I saw it. A climbing polygonon also attracted my attention with its vigorous growth and floriferous habit, that makes it well worth a place in any garden; perhaps it is not quite as good as our white antigonon, to which it is related. The Ballarat Gardens are under the municipal council, as also are the large park lands adjoining, about 150 acres combined. These are well planted with trees, and, with the lake, covering 600 acres, on one side, where motor boats carry passengers across to the other side, make ideal picnic grounds.

After leaving Ballarat my next stay was at Geelong. Johnston Park, in the centre of the town, near the Town Hall and Art Gallery, is in process of rearrangement and being added to, but sufficient has been done to show that it will shortly be one of the features of the city. The Botanic Gardens are some distance out of town, the entrance being through park lands that had suffered with droughty conditions. *Pinus insignus* had been largely planted in streets and parks, but are now being cut out, owing to being unsuitable; they were fairly large trees, and the timber commands a ready sale at good prices, being chiefly utilised for case timber for the dried fruit industry of Victoria. A fairly good collection of plants may be seen in the Gardens, but they are evidently not supported by the council to the same extent as at Ballarat. I was interested in seeing a fine specimen of *Harpephyllum caffrum* (Natal plum) doing very well, and Mr. Day, the curator, informed me that it fruited freely, and the seeds were in good demand. A fine plant of the Queensland flame tree (*Sterculia acerifolia*), doing very well, also attracted my attention. A large bushhouse with some fine specimens of *Rhopalostylis sapida* from New Zealand and *Rhopalostylis baueri* from Norfolk Island stood out well amongst many other palms. There was also a nice lot of ferns.

From Geelong to Melbourne is not a very long journey—45 miles. On arrival there I lost no time is getting into touch with Mr. Cronin, the curator of the Melbourne Botanic Gardens, who spared no effort to make my visit both pleasant and profitable, and very kindly helped with a fine lot of plants for our Gardens. The design of the Melbourne Gardens is a very fine example of landscape gardening. There are ten principal divisions, each under a distinctive name—Western, Hopetoun, Prince's, Oak Lawns, and so on. The groupings of trees and shrubs leave little to be desired; it shows off the very fine collection of plants most advantageously. Such a collection! I could have spent many days of profitable time there. The fern gully is one of the features of the Gardens—but then there so many fine features. It has been planted to show how tree ferns grow naturally; large trees here and there provide sufficient shade for the ferns; running water is seen in plenty, natural-looking watercourses carrying it about all through the area. The tree ferns are growing quite close together, forming quite a dense thicket. The curving paths that wind through this delightful spot provide a place for a well-shaded stroll on a hot day. The whole atmosphere of Fern Gully reminded me of that of one of our North Coast scrubs. There are about 10 acres of water—lakes have been formed from original swamps, designed, too, with taste, that gives a beautiful effect; while here and there are islands that provide a sanctuary for the numerous waterfowl that inhabit this favoured region. Numerous water plants fringe the banks; at the ornamental lily lake may been seen a fine lot of nymphæs. Many of the newer kinds that have been raised by cross fertilisation have beautiful large flowers. In a number the shades of pink are very fine. The large collection of Australian plants appealed to me very much. There appeared to be miles of a long border running along the western and southern boundaries of the Gardens. Here may be seen, probably, the finest collection of purely Australian vegetation to be found anywhere. Needless to say, our State is well represented. Plants in systematic arrangement of natural orders are grown in pots in a pavilion or lattice shade house—there is a very good collection, about 160 natural orders being represented, and it must be of great benefit to students. The growing of them in pots naturally entails a good deal of work. The Adelaide system of growing in open ground has many advantages, but the Melbourne system enables the collection to be kept in a much smaller area, and additions may be made at any time; but I must not make comparisons. The glasshouses, though not very extensive, are well stocked with a good collection of orchids, ferns, palms, and foliage plants, and fine displays of gloxinias, begonias, and other flowering plants are made in their seasons. Mr. Cronin has been doing some good work in the cross fertilisation of watsonias, iris kæmpferi, and dahlias; he showed me some fine seedling watsonias—large flowers, in many shades of colour. His seedling iris also were very good, in many instances showing a great improvement on those imported from Japan. Mr. Cronin is an enthusiastic dahlia grower; I am sure you would all enjoy listening to him dilating on this, one of his pet subjects. I should like to see him here and hear him give us a paper on this or some other subject that he is keenly interested in. To summarise my impressions of the Melbourne Gardens, the outstanding features are the extensive well-turfed lawn areas, beautiful landscape views, fine groupings of trees and shrubs, the fern gully, Australian vegetation, beautiful lakes, and fine rock gardens and mounds. With Mr. Cronin as guide, I paid a visit to Brunning's nursery, and was struck with the immense number of dahlias that are propagated from cuttings each season. We also made a call at Rippon-lea house. This beautiful house and grounds, once the home of Sir Frederick Sargood, is now the property of Mr. Nathan, who is an enthusiastic horticulturist. He has built large conservatories and plant houses, and, stocked full of the finest plants procurable, makes it one of the show places of Australia. In no public gardens can better plants be seen

—house after house full of orchids. Such a feast of beauty! Another house all caladiums, and fine plants too. It was interesting to note that many of the best originated in Queensland, raised chiefly by Mr. Summerlin, of this city. Mr. Orchard, the head gardener in charge, who, by the way, is a very keen gardener and noted orchid-grower, said that better caladiums than some of the Queensland-raised ones could not be obtained anywhere. Before leaving Melbourne I felt that no horticultural visitor to the city can fail to be delighted with the fine parks and gardens in and around Melbourne—avenues of trees, and, in many cases, street gardens. All classes are developed—green lawns, rock gardens, flower beds, and mounds all lend themselves to the beautification of their surroundings. It would take too long to-night to go into detail, but I must mention Alexandra Avenue and St. Kilda Road, of the thoroughfares, and Alexandra Park and Fitzroy Gardens.

After saying good-bye to my Melbourne friends, Sydney claimed my attention. At the Sydney Gardens I was very kindly received by Mr. J. H. Maiden, I.S.O., Government Botanist and Director of the Botanic Gardens, who has done so much good work on the flora of Australia. He has a very lively interest in Queensland, and expressed a desire of assisting me in every possible way. When handing me over to Mr. Ward, the Superintendent of the Botanic Gardens, Mr. Maiden made known these wishes. Mr. Ward carried out his part admirably, and I spent a most enjoyable and profitable time. The Sydney Botanic Gardens have a very high place in the gardens of the world. Where could a better position be found than on the shores of the incomparable harbour? The sloping banks of turf and beautiful lawns, the large collection of plants displayed in such fine arrangement and in high state of cultivation, give a visiting horticulturist a study that is both profitable and interesting. I noticed several fine improvements since my last visit—the rearrangement of the trial grounds; the building of a system of humus pits, whereby all vegetable matter of garden refuse is rotted down and returned to the borders; the raising of one of the lower lawns by stripping the turf, filling up with a good depth of soil, and replacing turf, making a fine lawn of what used to be a very low-lying piece of ground. One of the new rockeries in the lower garden has a fine collection of Phyllocacti, many of them being Sydney Botanic Gardens hybrids, showing great promise. Mr. Ward is an enthusiast in this and many other phases of garden work, and I was very fortunate in being able to obtain from him for our Gardens a good collection of Phyllocacti that should do well here. A very valuable donation to the Sydney Botanic Gardens was made last year—the "Burton Bradley" collection of bulbs and plants, numbering about 10,000, comprising the best hippeastrums, over 4,000 bulbs representing over thirty-six years' work in cross-fertilisation, Amaryllis Belladonna, over 3,000 crinums, all known species and many hybrids that would be hard to beat anywhere, gladioli, clivias, miniata hybrids equal to the best imported kinds, a fine lot of Gloriosa hybrids, and collections of most other flowering bulbs. The late H. H. B. Bradley was a very keen horticulturist and a life's work is represented in the collection. Fortunately, through his family donating the whole to the Botanic Gardens, the work can be carried right on. Mr. Ward brought under my notice a strain of gladioli named "Fordhook," hybrids that flower from seed in four months. A packet of seed for trial were sown at the end of December; 75 per cent. of the plants flowered by the following May; dying down, they were lifted in June, planted again in July, and flowered again in November and December, giving two flowerings within twelve months from seed. Gladioli plants from other seed sown at the same time were only 4 inches in height when Fordhooks were 2 feet high with 15-inch spikes of flower.

The Palm collection in the Gardens is a very large one, and grown as they are in a well-sheltered position, with a soil that suits them, many fine and rare specimens may be seen. I was again very fortunate in being able to obtain quite a number for our Gardens. Another interesting collection, that of water plants grown in large glass jars in a bushhouse, must be of great benefit to students. The large collection of Opuntias (prickly pear), probably the finest anywhere, all named, is an evidence of Mr. Maiden's interest, and good work accomplished, in classifying, and assistance in other ways, to deal with this awful pest. The Eucalyptus collection, also a very large one, somewhere in the vicinity of 200 species, is a reminder of those magnificent

tasks that Mr. Maiden is still hard at work upon. "The Critical Revision of the Genus Eucalyptus" and "The Forest Flora of New South Wales" when completed will be lasting monuments of his life's work.

The glasshouses are a strong feature of the Gardens, some fine show houses open to the public at certain hours are well stocked with a beautiful collection of plants, notably palms, crotons, nepenthes, ferns, dracenas, and anthuriums. The palm collection is very large and well grown. Other houses hold a fine collection of orchids that appears to have been largely added to since my last visit. Altogether there is a splendid range of glasshouses and frames of a well equipped, substantial nature, and every opportunity is taken to make fine displays for the benefit of visitors.

A Japanese garden, with quaint stone paved paths and typical rustic bridge over adjoining pond, attracts attention. It is well furnished with Japanese plants consisting of numerous small-growing beautiful bamboos, iris, maples, and some fine varieties of Hydrangeas that were in full flower. Many of these are not yet grown in Brisbane. The Sydney Botanic Gardens are well kept under strict regulations. Even smoking is prohibited. This regulation, although irksome to many, saves the inevitable litter that careless smokers throw about.

The Centennial Park, also under Mr. Maiden, with Mr. Dawes as superintendent, is well worth a visit. The rose garden is beautifully laid out and contains a very large collection of roses. Mr. Dawes also has a fine lot of nymphæs doing well in one of the large lakes. They create a very fine effect when in flower. Avenues of Phœnix canariensis, doing remarkably, add beauty to the landscape. Good displays of flowers in beds also are made. One, a large bed of bouvardias on the main drive, was a picture, the plants being covered with flowers. The park, covering as it does a very large area, is intersected with over 20 miles or roadways that have a smooth tarred metal surface, that makes it a favourite motor car ride.

The Sydney Municipal Council have made great strides of recent years in improving their parks and open places in streets. These latter, not having the generous proportions of the Adelaide or Melbourne ones, cannot be developed to the same extent, particularly with tree planting. Hyde Park is being drastically dealt with by the removal of many of the old Moreton Bay fig trees, and the formation of rockeries, mounds, and flower beds. A beautiful display of Iris Kæmpferi massed together in large beds attracted the attention of thousands of delighted visitors. For gorgeous colourings, particularly in tones of blue and purple, these flowers cannot be equalled. Mr. Ward kindly acted as guide to some of the large private gardens. We were well received and spent an enjoyable time. It rather made me envious that in all the Southern States so many fine private gardens are to be seen, whilst in Brisbane they are practically non-existent. We are worse off now for large private gardens than in former years. Amongst those visited mention must be made of Crow's Nest, Lady Hay's beautiful old home, where Mr. Godwin, a skilled gardener and hybridist, has done so much to improve many old species of plants. His display of Anthurium Scherserianum hybrids in full flower was worth going many miles to see. Mr. Godwin has also raised many orchids and other plants from seed, a number of which have attracted great attention in England. A visit to the garden of Mr. Sayers showed what can be done with what was naturally an almost inaccessible gully. Winding paths, small seats perched here and there, the large collection of plants, grown under natural conditions, give the perfect atmosphere of a true "wild garden."

In conclusion, I desire to say a few words about the suburban gardens. Around Adelaide, Melbourne, and Sydney the suburban gardens are well developed, beautiful cottages homes with fine displays of flowers showing the horticultural taste of the occupiers. These are not met with in isolated instances but in quantity, miles of them. A trip around our suburban districts will reveal that although some of our suburban homes are well supplied with gardens the number is not as large as it should be, and the taste for horticulture needs fostering and developing to a much larger extent than at present. It is the duty of not only the members of this society but all classes to push on this good work. Regarding plants to grow—plant those things that will do well here. Don't try to grow carnations for instance when gerberas will do so much better.

Botany.

THE RED ASH (*ALPHITONIA EXCELSA*), A VALUABLE FODDER TREE.

By C. T. WHITE, F.L.S., Government Botanist.

Description.—A medium-sized tree; bark on the older trees greyish-black, rough and furrowed; on the younger trees whitish and rather smooth; timber red. Young shoots hoary or rusty with close hairs. Leaves mostly oblong-lanceolate, but varying somewhat in shape, bright green above, white underneath. Flowers greenish-white, usually very numerous. Fruit up to ½-inch in diameter. (Flowering months, February and March.)

The tree can readily be told by the peculiar scent of the young shoots; if these be bruised or snapped off, and the bark peeled from them, they emit quite a distinct odour of sarsaparilla; this scent is quite absent from the older branches and branchlets.

Distribution.—A very common tree in Queensland and New South Wales, found in a wide range of localities, as on ridgy forest country, poor coastal sandstone areas, good forest land, in the inland scrubs, and less commonly on rich basaltic "scrub" land. Though most abundant in coastal areas, it extends considerably inland, specimens having been received from as far west as Lochnagar, about 350 miles inland on the Queensland Central Railway. (Coll. W. Johnson.)

Common Names.—It is most generally known as "Red Ash," occasionally as "White Ash" or "White Leaf" and sometimes under the rather absurd names of "Silver-leaved Wattle" and "Apple Tree"—names that more correctly belong to other trees. It is also quite commonly known colloquially as "Alphitonia."

Forage Value.—Wherever this tree is growing and cattle have access to it, the young plants are generally seen to be considerably trimmed down. Some little time back, Prof. H. C. Richards brought me specimens from the Springsure district with the report that Mr. M. Cavanagh, of Vandyke Station, had told him the tree had proved a most valuable fodder during drought periods. In conversation Mr. F. H. Drake informed me that the tree was fairly plentiful in the Central District, and was universally regarded by stockowners as a valuable fodder. In forwarding specimens from the Chinchilla district, Forest Ranger G. Singleton states:—"Grows chiefly in the scrubby country, average size, 6 in. diam., 15-20 ft. high. [Grows much bigger on the coastal country.—C.T.W.] Fairly plentiful in the western scrubs; leaves very good fodder for stock." In forwarding specimens from the Texas district, Mrs. H. W. Booth wrote, under date 30th October, 1919:—"The leaves are relished by stock during the present scarcity of other fodders; some people have been felling it, and their cattle seem to thrive on it, looking well even during this extremely dry time." Mr. J. Schmeider, of Rosedale, informed me that it was almost impossible to get cattle or horses past it without their having a mouthful, all classes of stock being extremely fond of the leaves.

Botanical Note.—The remarks made and the plate reproduced refer to the commonest Alphitonia that occurs in Queensland, and that seems correctly referable to the typical *A. excelsa*, but several other trees have also gone under that name here which can hardly be referable to the same thing. One of these is very common in the "scrub" country of the coast. When the bark is peeled off, even from the trunk and older branches, a very powerful scent of sarsaparilla can be noticed, and on this account the tree is commonly known as "Sarsaparilla." It apparently is confined to the rich "scrub" (rain-forest) areas of the east, and often comes up very thickly in practically pure stands after a burn; it, also, is freely eaten by stock. My attention to the difference in these two trees was first drawn by Mr. W. R. Petrie, Forest Officer on Fraser Island. In addition, there are other trees showing further differences. Alphitonia has a wide range beyond Australia, and a complete set of Queensland material has recently been forwarded to the Royal Botanic Gardens, Kew, England, for botanical investigation and comparison with extra-Australian forms.

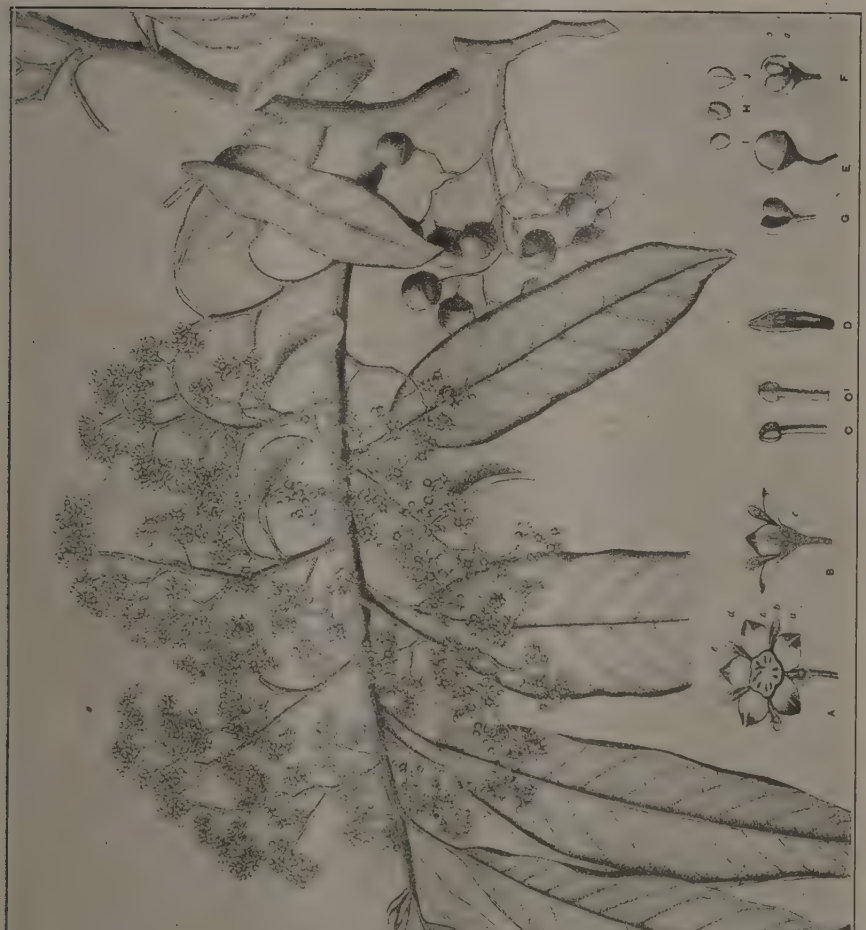


PLATE 16.—THE RED ASH (*Alphitonia excelsa*), Reissek.

A, Flower; B, Longitudinal section of flower; C, Stamens; D, Petal, including the stamen; E, Fruit, showing the rim or cupule; F, Fruit dissected to show the two nuts or cocci; G, The nuts or cocci; H, I, J, Seeds; A.D, Enlarged; E.J, Reduced.—After Maiden, "Forest Flora of New South Wales."

Forestry.

Much as we have, from time to time, written on this most important subject; much as we have learnt from the forestry work of the United States of America and of Europe, and much as our Queensland Department of Forestry has already done and is earnestly doing to conserve to the country an adequate supply of our indigenous timbers, we, in common with the American people, are still a long way from making up for the depletion of our most valuable timbers. What has been done in the past to replace the splendid eucalypti, the Moreton Bay pines, the red cedar, the yellow-wood, the swamp gums, the silky oaks, and the many other useful timbers which abounded in our scrubs and forests from one end of the State to the other less than fifty years ago? Is it not possible to interest the farmers and graziers in this important matter of reafforestation? How easy should it be to plant such trees as are suitable to the various localities, both inland and on the coast, on the boundary lines of their holdings.

How is this matter of forestry considered in the United States of America? The following from the "Pacific Rural Press" is well worthy of our notice:—

"There has never" says that journal, "been a time in the history of California when so many persons were interested so intelligently in the preservation and proper utilisation of our forests. One can hardly open our country newspapers without noticing editorials showing that the recent visits of Gifford Pichot, the capable chief of the Forestry Division at Washington, and some of his assistants, have had an excellent effect in arousing public attention.

"Every farmer should take an intelligent interest in the proper care of our California forests. They should be very dear and near to his heart, and he should think of their management as, after all, based upon the same principle of agriculture which he tries to follow in his own ancient and honourable business. There is certainly a point of view—and one that writers upon forestry topics too often neglect—according to which all the timber lands of the State may be called but a vast wood orchard, a forest farm whose slowly ripening crops are harvested from time to time. Rightly, then, it should be properly sown and properly harvested, at the intervals shown by experience to produce the largest crops.

"Practical forestry is really not unlike practical wheatgrowing, or practical orchard-planting, except that it moves in such long periods of time that it needs the fostering care of governments and strong associations until its requirements are everywhere understood. Everything yields after its nature: the alfalfa field three to five times a year; the wheat annually; the cabbage seed biennially; the tannin-bearing acacias once in ten years; the Douglas spruce forest once in fifty years. There are soils and situations, too, for every different kind of farm crop—and there are immense areas of land which can be used only by planting them to timber crops.

"Suppose that a new continent were to be discovered where wheat grew as abundantly as do our wild grasses, and where excellent apples and apricots hung on the shrubs. If the pioneers of such a land grazed the wild wheat areas, or cut the apricot thickets for firewood, disregarding the laws of higher usefulness and carefully managed reproduction of these crops, the time would soon come when the land would be a barren waste. The law of the wheatfield, that it must be protected and allowed to grow until it is fully ripe and fit for use, is also the law of the century-growing forest, and both alike are shapen to the needs of man.

"It must be because the essential unity of the forester's work, with all correct agricultural practice, is overlooked, that one sometimes finds farmers speaking of the talk about saving the California forests as merely a cry of maudlin sentiment. 'We must have firewood and lumber,' as a man once said to me, and he added: 'You University fellows want to have the Government preserve the forests so that lumber will cost a lot more than it does. All you want is better hunting and fishing.'

"The use of this word 'preserve' has often seemed unfortunate. What we really want is a better utilisation of all our forest resources. What we really mean is that we wish to prevent waste and destruction, to increase the forest supplies, to multiply its manifold uses, and to cheapen in the long-run all its indispensable products. We really mean by 'preserve' and 'protect' exactly what the farmer means when he fences his wheatfield and cultivates his orchard.

"How simple and how reasonable it seems—this utilitarian view of the forests of the State! There is a large portion of California that is worthless for any other

purpose except to grow trees and scanty pasturage. It is many times more valuable for growing a timber crop than it is for sheep, goats, or cattle. It is without any other agricultural value. Let us grow timber there, and let us grow it in a systematic and careful way. We can greatly increase the average annual yield of the land; we can have an absolutely safe revenue for all time to come.

"The practical forester says: 'Here are 100,000 acres of mountain land, covered with wild forests. Some of the trees are mature; they will not grow much larger in a hundred years, and so I will sell them to the lumberman. Some of the forest consists of poor kinds, and I will gradually replace those trees with more valuable sorts. In some places I can thin the forest, in others I must have 'mother trees' and let seedlings grow in brave young thickets. In the course of a century, I can very greatly increase the value of this 100,000-acre forest.'

"Because it takes so long to carry out such far-reaching plans, should the farmer who has passed from annual crops to thirty-year rotations of orchards fail to greet the forester as a brother of agriculture?

"The farmer himself will often discover that the right practice of agriculture upon his own farm includes much forestry. He will need a wood lot, or waste and rocky areas can be devoted to the growth of timber. He may possess tan-bark oak, or redwood, or pine, or eucalyptus forests, and here he can apply the same good old principles to protect his crop till it matures, and then to gather in due season its increase—nor need he wait a lifetime in this land of rapid growth.

"As shown by their interest in recent forestry meetings, the leading lumbermen of California recognise the fact that their business depends upon better knowledge of forestry methods. When our forests are destroyed, the lumberman must plant more, at great cost, and wait for many years for them to grow, or else they must go to the Congo and assault Stanley's 'Great Equatorial Forest.' Every thoughtful lumberman knows that he is taking from the future. Now that he better understands the subject, he begins to take a prominent part in forestry organisations.

Farmers should be especially active in every forestry association and public meeting, to secure legislation or congressional action. The farmers of California as well as the lumbermen are vitally interested in the preservation of their forests. Farming cannot long continue in a country whose forests have been destroyed. This side of the subject has been explained in a thousand ways, but its immense practical importance justifies its presentation over and over, until every farmer takes an active interest in forestry topics.

"To sum up this brief paper, forestry is primarily forest study and forest care. The crop of forests consists of firewood and timber. That crop can be increased and made more valuable by employing skilled foresters. The proper management, both governmental and private, should receive the support of the farmers of California, since neglect and ignorance of forest affairs will work such vast and irremediable ruin. Under the conditions of life in this Republic, it is necessary only that enough people shall work together long enough to produce any desirable result. Let the farmers and the lumbermen, therefore, decide to put the management of all our California forests upon a scientific basis."

RECORD HOOP PINE LOG.

In March last, the following notes on a large pine-tree, felled and logged in the Mary Valley district, were recorded in the Brisbane "Daily Mail":—

"The Mary Valley State forests grow some very fine specimens of hoop pine, but seldom produce such a tree as was logged last week. The length of the log was 153 ft., and the girth at the butt 142 in. The quantity of millable timber logged from the tree was 9,355 superficial feet, of which 5,388 superficial feet was first class, and is worth 21s. per 100 superficial feet on trucks, Imbil. The remainder, being knotty, is worth 8s. per 100 superficial feet on trucks. The total value, on trucks, is £72 2s. 4d. Marketing costs amounted to 5s. 3d. per 100 superficial feet. The Forest Service netted £47 11s. 2d. for the tree, the logger and teamster received £24 11s. 2d. for their work. The sawn product will be worth at least £150. While much of the first-class logs will be sawn into valuable wide boards, which will not be used for buildings, the quantity would be sufficient to build a five-roomed dwelling."

This corroborates the statement by the late Mr. Turnbull, published in the January issue of this journal, that he had seen hoop pine trees in the Mooloolah district having a diameter of from 3 to 6 ft. The tree above alluded to had a diameter of about 4 ft.

Entomology.

2.—THE BANANA WEEVIL *(COSMOPOLITES SORDIDA, Chevr.)*

By HENRY TRYON, Government Entomologist.

CONSIDERATIONS INFLUENCING METHODS OF REPRESSION.

(a) Traps.—In the course of a recent visit to certain banana plantations in which the Banana Weevil had become established, it was noted that their proprietors were using portions of the plant of two kinds as so-called "traps," and, in so doing, were following a method fraught with risk of further dissemination of the insect they were endeavouring to exterminate. In fact, the method alluded to ignores the following ascertained habits of the insect in question:—

Any particular weevil that has visited a detached portion of a banana plant, or "trap," may have come from a banana stool adjacent to where this portion has been placed, and may thus itself be evidence of this stool's infestation; but often it is derived from a banana stool growing several yards at least away, and from which it has come in the course of its flight, for it is a flying insect liable to be attracted by the natural odour that attaches to this "trap." Thus, if such portion be placed at the foot of a non-infested stool a few yards distant from an infested one, this non-infested stool—should all the insects visiting this "trap" be captured or not—may, in turn, itself be attacked.

This incident may occur in either of two ways, according to the nature of the portion of banana plant or "trap" used.

This arises from the fact that in visiting any "trap" the weevil may have two purposes in view:—(1) to feed; and (2) (if a female insect) to deposit its eggs and effect its increase.

As regards the "trap," should it consist of a section of the banana stem only, the visiting beetle's first purpose—that of feeding—is alone served, for we have not found that it breeds in such a "trap." And having fed, the female weevil is wont to leave and lay its eggs in any suitable banana plant at hand. On the other hand, should a portion of the corm or root stock form the "trap," it may serve as a place where the beetle (if a female) may lay its eggs also. We have met, not only with eggs, but with grubs in all stages of growth also, in these "traps." Thus may be brought about the presence and development of the weevil in a spot where it was previously absent.

Collecting the banana weevils that have been attracted during successive nights once every morning may reduce the risk of these happenings, but not entirely remove it.

Fortunately, in view of these possible happenings, the insect, on issuing from an infested stool, is evidently not generally in the habit of flying far from the stool from which this took place; and often, if this (the banana stool) be still but little injured or infested, it will return to it, and so fulfil its two requirements already mentioned. Facts, however, indicate that it may on occasion pass unvisited several intermediate stools prior to settling down.

It follows from the foregoing that:—

1. These "baits" should not be used generally outside the area of beetle-borer infestation in any plantation.
2. In employing them, to decide the insects' presence or otherwise and range of occurrence; they should not be laid in or amongst apparently "clean" banana stools growing adjacent to a known infested area; but in this trap-laying a commencement should be made in the neighbourhood of stools growing more or less remote from it, the line of "baits" being gradually moved towards it until serving to attract the beetles.
3. It is preferable when laying the "baits" to place them on the soil between the banana rows, or on tracks traversing the plantation. We have observed that the beetles will visit "baits" on hard, bare roads and on the tops of standing tree-stumps.
4. A portion of a corm or root stock, or of the part of a sucker composed of the same, forms a better "bait" than a portion of a banana stalk; as being more attractive, easier examined with certainty of beetle discovery if present, and longer beetle-frequented.

5. Every "trap" should be examined for beetles once a day, preferably in the early morning, such examination requiring that it be very gently overturned to prevent beetle dislodgment; and the soil on which it has rested receive, too, close attention.

6. The cut surfaces of "traps," if found on this examination to be dry, should be pared, and all should be removed and destroyed after being exposed for two or three weeks at the most, especially if they be not already internally dry.

Note.—It is not to be inferred that trapping, as alluded to, and the capture thereby of the banana weevils yielded by any infested plantation can result in the destruction of more than a portion of the insects present.

(*b*) *Infestation of Banana "Suckers" or "Sets."*—When these are left upon the ground to dry on being separated-off, and before removal therefrom, to where they are to be planted, the female banana weevil may gain access to them, and then lay its eggs in them as in a "trap." This will happen more especially if such suckers be massed in an open crate and suffered to remain in or near a weevil-infested area.

Accordingly, when to be employed in establishing a new plantation, or in the extension of an existing one, the suckers should be removed before nightfall, on the same day on which they are taken out, and dried-off at some distance from the source. Of course, suckers must not be taken from a known infested area; but the foregoing precaution is demanded even, where infestation of their place of origin is not even at the time suspected, but may nevertheless occur.

(*c*) *Destruction of the Beetle by Starvation.*—A local banana-grower testified in the presence of three witnesses that a number of living beetles contained in a tightly closed glass phial that he displayed had been without food for one month; and scientific testimony would suggest further, that this period, under circumstances often realised, might extend for three months. It will happen then that, should the stools containing or presumed to contain the banana weevil be wholly extirpated and destroyed in any infested area, any beetles ensconced or covered up in the soil, and whether enclosed in fragments of the stool or not, may during many days following such destruction, effect their exit and fly off to banana stools growing more or less near to the place where they have originated. Accordingly, to lessen this migration, "traps" should be at once laid, and their use for same days persisted in, on land that has thus been "cleaned up."

During the mid-winter months, the adult insects or weevil-beetles arise from the pupa (chrysalis) in far fewer numbers than at other times. This, then, is the season for banana-eradication as a controlling measure.

(*d*) *Egg-laying.*—In Note I. on the Banana Weevil ("Queensland Agricultural Journal," xiii., p. 167, Ap., 1920) we have mentioned one site selected for the receipt of the banana weevil's eggs, and also how they are inserted in the plant's tissue. Further observations teach that they may also be laid singly in or on any cut surface of a banana corm, a minute fissure serving often in the former case the purpose of a special puncture. The points of small offsets of the root stock, whilst still beneath the soil surface, as well as the top ends of the corm-portions of the suckers that are known as "peepers" are availed of for the insertion of the eggs by the female beetle in the ordinary way.

The appropriate action, based on these facts, that is called for, is obvious.

REPORT, BUREAU OF SUGAR EXPERIMENT STATIONS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon "Cane Grub Investigation" from the Entomologist, Dr. J. F. Illingworth:—

Continued dry weather is telling seriously upon the cane crop, in the region about Meringa. This particular spot appears to just miss all the good showers that occur further up the line. Even the cane at Greenhills, which is usually well advanced at this season, still has to be chipped and cultivated, for it is not covering the ground. Cutting will necessarily be late and the crop short.

As has long been recognised, the cane grubs are most destructive to the crop during periods of drought. I have never seen the pest more abundant at Greenhills; and, though the grubs are still small, the tops of the cane are beginning to show the drying effects, brought about by the cutting off of the feeding roots.

As indicated in last report, I was compelled to limit my experiments with arsenic to ratoon crops; the results, which are just beginning to develop, are not proving very satisfactory, as will be explained later on. The same may be said in regard to the application of Muscardine fungus.

DEVELOPMENT OF *LEPIDIOTA ALBOHIRTA* (GREY-BACKS).

As has been described the beetles emerged very late at Greenhills—in fact, almost two months after their usual occurrence—and they have continued to emerge, so that even now (15th March) beetles with undeveloped eggs are still to be found on the feeding-trees; and we frequently uncover clusters of the newly laid eggs in digging for grubs. Moreover, some of the eggs that were laid by the first beetles have already developed into grubs of the third or final stage; hence we now find every condition of the life-history represented in the soil—eggs, first, second, and third stage grubs, with beetles ovipositing.

The first newly hatched grubs that we were able to locate this season, by digging, was on the 18th of February. At that time I also took a beetle in the soil, from which I squeezed twenty-seven ripe eggs. It will be recalled that this species has the habit of placing the whole egg-cluster in a well-formed cell about 5 or 6 inches below the surface.

Recent observations indicate that it is the usual practice of the beetle when flying to the cane to come to rest on the stalk; and, later, to crawl directly down and enter the soil at its base. This habit results in the placing of the egg-cluster in a most favourable position, especially in the case of ratoon cane, for they are out of reach of cultivation, and the grubs develop undisturbed. Investigation during the past month leads me to conclude that, especially during dry weather, the young grubs do little migrating if hatched in old ratoon stumps, for they are best protected there against drought, and they have an abundance of food in the form of decaying organic matter from the old roots and seed-cane. These observations will be referred to again, for they help to explain the unsatisfactory results with arsenic.

By 3rd March, about 10 per cent. of the grubs had reached the second stage, though the beetles were still abundant on the feeding-trees. It may be remarked that these grubs in growing shed their skins three times; after each moult the hard parts of the head are noticeably larger—of almost a standard size, with no regard to the size of the body. Hence, it is an easy matter, with a little experience, to sort the grubs, as to size of the head, into the various stages.

On 15th March, we found a few of the grubs had already reached the third stage; about 50 per cent. were still in the first—many just hatching; while the remainder, somewhere between 40 and 50 per cent., had changed to the second stage.

LEPIDIOTA FRENCHI—INCREASING ACTIVITIES.

As is now known, this species has a two-year life-cycle; hence the beetles are more numerous alternate years, and the grubs are never noticeable the season following the big emergence of the beetles. It is during their second year in the soil that the full-grown grubs (third stage) are so destructive. They feed on the roots from September to May, thus doing their worst injury to the cane before the eggs of the Grey-backs are laid.

In the region about Gordonvale, this is the year for trouble from the grubs of this species, and we may expect a big emergence of the beetles in December, or as soon as the rains set in.

This pest, formerly restricted more to grass lands, is becoming increasingly abundant in cane areas; I have never seen them worse than now. They are spreading rapidly, too, to sections formerly considered immune; and in some places they appear to be displacing the Grey-backs. They certainly require immediate investigation, for their habits differ materially from those of the ordinary cane grub.

The beetles apparently prefer to feed on low bushes, and probably are able to oviposit much sooner, with greater numbers of eggs. They certainly are much swifter in flight, and probably go longer distances. At any rate, we find the grubs destroying cane far removed from any possible feeding-trees. It is just possible that they may be able to oviposit without food, where feeding-trees are unavailable. This is true of *Anomala orientalis*, in Hawaii, which normally lays its eggs even before emergence from the soil. They are able to do this because the grubs store up a quantity of food, in the form of fat, before pupating and changing to the adult beetles.

ARSENIC FOR CONTROL.

Undoubtedly if arsenic can be placed in the soil right where the grubs are feeding it will quickly destroy them, as I have demonstrated by laboratory experiments. At the same time, the poison does not appear to in any way injure the cane.

Under field conditions, however, difficulties are met with, but I trust these may be overcome as we become better acquainted with the habits of the pest. In our experiments this season with ratoons, the best procedure that suggested itself was placing the poison in drills as near the sides of the stools as possible; where, it was hoped, the grubs would find it as they began to move about, soon after hatching. Under prevailing drought conditions, however, this has not worked out successfully. The young grubs have not migrated; on the contrary they have stuck close within the stool where they hatched, thus securing better conditions of moisture and food.

Theoretically, the best method of application would be to place the poison in the drill with the plants; preferably on the soil after they are covered. In this way it would have a tendency to work downward during cultivation, and be right among the roots at the time that the grubs hatched. It was my intention to use this method last season, had the drought not curtailed late planting. I had a good-sized field laid out at Greenhills for the purpose; hoping to determine, also, the amount of poison necessary.

On two other farms, near Gordonvale, arsenic has been applied extensively during the past season. On one, where used with ratoons, there is the same lack of success that we have experienced. On the other hand, Mr. R. Blackwell, on the Riverstone road, used arsenic in the drill with meatworks manure when planting last June. He mixed the poison at the rate of about 20 lb. for each bag of the meatworks, and applied about 5 cwt. of the manure per acre, hence about 70 lb. of the poison. This is the same amount that was used by Mr. C. E. LaCaze in his successful experience in the control of grubs on the Herbert River years ago.

It is pleasing to note that this cane of Mr. Blackwell's is as fine as any in the district, being far in advance of anything that I have seen recently. Here, again, we must not jump at conclusions, however, for he treated the whole field, without leaving checks.

Mr. Blackwell told me, however, that the cane in this area had suffered severely from grubs before, hence his decision to apply the arsenic. Furthermore, the ratoons on a nearby field are now showing grub-injury, which we found was due to the activities of *Lepidiota frenchi*.

POULTRY DESTROYING BEETLES.

It has been noticeable for a number of years, on the Greenhills Estate, that the cane for several chains on either side of the barracks is practically free from grubs. This is a point worthy of attention, since the camp is situated in the midst of the worst-infested fields.

Following upon the observation that the egg-laden beetles rest for some considerable time upon the cane plants, after their flight at daybreak before attempting to enter the soil to oviposit, is it not credible that the fowls about the camp, feeding upon the beetles, might so deplete their numbers as to give the result? Fowls are very early risers, and by two hours' active search, a large flock could clear a considerable area.

I shall be interested for any evidence along this line from growers who have cane adjoining the farmyard.

MUSCARDINE FUNGUS FOR CONTROL.

Though grubs destroyed by this fungus are often found abundantly in certain fields, under favourable conditions, it apparently cannot be depended upon as an important controlling factor.

Recent experiments in treating grub-infested soils with pure cultures have been very discouraging. In no case have I been able to find diseased grubs in the treated plots. In all probability this is due to the abnormally dry conditions prevailing. We found by laboratory experiments with the fungus on grubs, that mortality was greatest under moist, cool conditions, so probably epidemics occur only when weather conditions are favourable.

From time to time we dig up grubs that have been killed by this fungus, at Greenhills, thus indicating that the spores are present in the soil and continue from year to year. Even grubs in the first stage succumb to the disease, as I have observed recently.

MERINGA PLOTS.

Located on the highest ground, these experimental plots have suffered extremely from the unfavourable weather conditions. To begin with, there was much delay in getting the cane cut, so that many of the stools were sapped out and allmost dead before the ratooning was started. Then, too, in several of the plots there is injury caused by the grubs of *Lepidiota frenchi*. Furthermore, the field is not fenced, and considerable areas have been devastated by stray stock.

Altogether, there is little to be expected from this area, unless we have a long-continued rainy season, which is not now in prospect.

General Notes.

SOCIETIES, SHOW DATES, ETC.

BOWEN.—The Annual Show of the Bowen Pastoral, Agricultural, and Mining Association will take place on 1st and 2nd July, 1920.

KILKIVAN.—The annual show of the Kilkivan Agricultural, Pastoral, and Industrial Society, set down for 26th and 27th May, has been postponed to later in the year, owing to the adverse season.

MARYBOROUGH.—The Wide Bay and Burnett Pastoral and Agricultural Society's fifty-second annual show will be held on the 8th, 9th, and 10th June, 1920.

PALMWOODS.—The Palmwoods Fruit Growers' Association. Sec., Mr. W. Browne.

TOOGOOLAWAH.—Toogoolawah Dairying and Industrial Association, second or third week in August.

TO PREVENT THE STAGNATION OF WATER.

In reply to a correspondent, Mr. J. C. Brünnich, Agricultural Chemist, to whom the question was submitted, advised as follows:—

"As a rule, growth of green algae does not cause the water to become stagnant, but if the growth is too rapid, it may be prevented by addition of very minute amounts of copper sulphate. The quickest method is to put a few handfuls of copper sulphate crystals in a muslin bag and drag it a few times backwards and forwards in the lagoon; repeat if necessary after a few days. Only small amounts are required; large amounts used would be poisonous."

RARE SUGAR FOUND IN HONEY.

In the March issue of the Journal, we made reference to the occurrence of a rare and valuable sugar found, as stated in the "Weekly News Letter," Washington, U.S.A., in honey. The Hawaiian "Forester" for February, 1920, also draws attention to this substance as being rare, and in great demand for use in scientific laboratories under the name of Melezitose. It is suggested that it formed one of the constituents of the manna of Scripture. Some years ago a sugary, crystallised, whitish substance fell at a certain season from some member of the Eucalyptus family, and adults, as well as young people, used to collect a sugary substance therefrom lying on the grass. Might this have been the same sugar?

ANALYSES OF MANGO KERNELS.

Mr. W. Robertson, of The Hollow, Mirani, near Mackay, recently wrote to the General Superintendent of the Bureau of Sugar Experiment Stations, stating that he had an idea that mango kernels might contain good food for pigs, either raw or boiled, and asked that an analysis might be made. This was carried out by the Agricultural Chemist, Mr. J. C. Brünnich, with the following results:—

Moisture	48.39 per cent.
Crude Protein	3.15 „
Carbohydrates	42.06 „
Crude Fibre	.57 „
Crude Fat	4.53 „
Crude Ash	1.30 „

Of the whole seed, the kernel represented 66.7 per cent. and the husk 33.3 per cent.

The Agricultural Chemist remarked:—"From the analyses it appears that mango kernels, which represent two-thirds of the weight of the seed, have a very good feeding value, equal to that of a good quality of hay."

Answers to Correspondents.

SULPHUR AND LIME AS A FERTILISER.

J. H. BARBER, Crow's Nest—

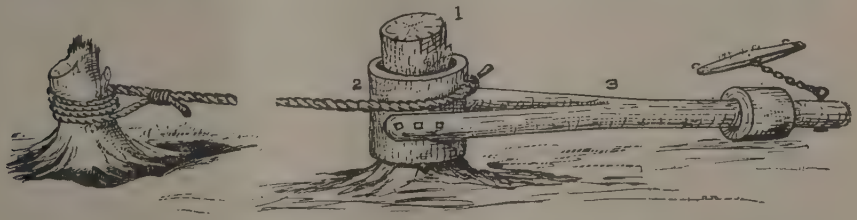
In reply to your letter, Mr. J. C. Brünnich, Agricultural Chemist, advises: "In my pamphlet 'Complete Fertilisers' I mentioned that flowers of sulphur have been reported to act as a fertiliser. The value of lime is well recognised. The question of sulphur buried in the ground acting on insect pests is quite problematical."

AN EFFECTIVE STUMP EXTRACTOR.

NEW SELECTOR, Herberton—

In reply to your inquiry concerning a cheap stump extractor, there are several fairly cheap machines on the market, amongst which are the very reliable and powerful grubbers manufactured by Messrs. Trewhella Bros.; Brisbane agent, A. Robinson, 549 Queen street, Brisbane. See advertisement in the "Queensland Agricultural Journal," p. xxiii.

Some years ago, Mr. John Morgan, of Mount Berryman, sent us the sketch here reproduced of a remarkably simple, cheap, and effective stump extractor, which was worked by one horse.



A 12-inch drum is bolted to a forked sapling, and is slipped over a handy stump, round which it works. No tackle is required. A wire rope with a piece of chain at the end are all that is required. The pole is 10 feet long. The wire rope is made fast to the drum, and the other end passes round the stump to be extracted. No knot is used. As the horse moves round, a force of 20 tons is thus exerted, and no difficulty is experienced in dragging out very large stumps. The tackle can also be used on standing timber, care being taken to so arrange, by means of a tackle, that the tree falls away from the horse.

The drum may be made in two halves, to avoid lifting over a stump. The halves are simply placed against the stump around which it works, and are bolted together. The cost of the whole outfit would only be about £2. One man and a boy, it is stated, can stump half an acre a day with the machine. Such a contrivance should prove very useful on a scrub farm, as there are large numbers of scrub trees which have no tap root. In former days all scrub stumping was done with mattock and axe, which was slow and laborious work.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1920.

Article.		APRIL Prices.
Bacon	lb.	1s. 5d.
Bran	ton	£9 to £13
Broom Millet	"	£40 to £60
Broom Millet (Sydney)	"	£60 to £70
Butter (First Grade)	cwt.	200s. 8d.
Chaff, Lucerne	"	11s. 3d. to 17s.
Chaff, Mixed	"	11s. to 13s.
Chaff, Oaten	"	13s. to 14s.
Chaff, Wheaten	ton	£9 to £13 15s.
Chaff, Sudan Grass	"	£13 to £13 5s.
Cheese	lb.	1s.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 10½d.
Hay, Lucerne	ton	£14 5s.
Hay, Oaten	"	...
Honey	lb.	5d. to 7½d.
Maize	bush.	10s. to 11s. 6d.
Oats	"	...
Onions	ton	£10 to £22
Peanuts	lb.	7d. to 10½d.
Pollard	ton	£10 to £12 10s.
Potatoes	"	£12 to £14
Potatoes (Sweet)	"	£5 10s. to £13.
Pumpkins (Cattle)	"	£7 to £15
Eggs	doz.	2s. to 3s. 4d.
Fowls	per pair	3s. to 8s.
Ducks, English	"	5s. 6d. to 6s.
Ducks, Muscovy	"	5s. 6d. to 8s.
Geese	"	10s. to 13s.
Turkeys (Hens)	"	10s. to 15s.
Turkeys (Gobblers)	"	17s. 6d. to 35s.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	6s. to 16s.
Beetroot, per dozen bunches	...
Cabbages, per dozen	5s. 6d. to 24s.
Carrots, per dozen bunches	1s. 9d. to 3s.
Cucumbers, per dozen	3d. to 1s. 9d.
Lettuce, per dozen	9d. to 1s. 6d.
Marrows, per dozen	2s. to 7s. 6d.
Peas, per sugar-bag	10s. to 16s.
Potatoes (Sweet), per sugar-bag	6s. to 6s. 9d.
Pumpkins (table), per sack	8s. to 13s.
Tomatoes, per quarter-case	2s. to 5s. 6d.
Turnips(Swede), per sugar-bag	1s. 6d. to 2s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	APRIL. Prices.
Bananas (Queensland), per double-case ...	...
Bananas (Tweed River), per double-case	14s. to 26s.
Lemons, per bushel-case	9s. to 16s.
Mandarins, per case	4s. to 15s. 6d.
Oranges (Second Crop), per bushel-case	4s. to 13s. 6d.
Pineapples (Queens), per double-case	9s. to 14s.
Pineapples (Ripleys), per double-case	8s. to 14s. 6d.
Pineapples (Common), per double-case	3s. 6d. to 8s.
Tomatoes, per quarter-case	3s. 6d. to 8s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	13s. to 15s. 6d.
Apples, Cooking, per bushel-case	11s. to 14s.
Bananas (Cavendish), per dozen	2d. to 8½d.
Bananas (Sugar), per dozen	4½d. to 7d.
Citrons, per cwt.	10s. to 15s.
Cocoanuts, per sack	£1 5s.
Custard Apples, per half bushel-case	5s. to 10s.
Grapes, per lb.	3d. to 9d.
Lemons (Lisbon), per half bushel-case	3s. 6d. to 15s.
Mandarins, per case	11s. to 18s.
Mangoes, per case	3s. to 11s.
Oranges, per half bushel-case	10s. to 16s.
Papaw Apples, per quarter-case	2s. to 12s.
Passion Fruit, per half bushel-case	2s. to 15s.
Peaches, per quarter-case	...
Pears	12s. to 16s. 6d.
Persimmons, per quarter-case	2s. 9d. to 5s. 6d.
Pineapples (Rough), per dozen	3s. to 10s.
Pineapples (Smooth), per dozen	5s. to 8s. 6d.
Pineapples (Ripley), per case	8s. to 10s.
Tomatoes (prime), per quarter-case	2s. to 5s. 6d.

TOP PRICES, ENOGGERA YARDS, MARCH, 1920.

Animal.	MARCH. Prices.
Bullocks	£19 12s. 6d. to £24 10s.
Bullocks (Single)	£27 10s.
Cows	£14 17s. 6d. to £18 2s. 6d.
Merino Wethers	45s. 9d.
Crossbred Wethers	46s. 6d.
Merino Ewes	36s.
Crossbred Ewes	66s. 6d.
Lambs	35s. 6d.
Pigs (Backfatters)	£7 10s.
Pigs (Light Bacon)	£4 15s.
Pigs (Porkers)	64s.

LAW SOMNER'S

Headquarters for

Grasses, Clovers, Lucerne, Rape, Swedes, and Turnips, Sheep's Burnet, Mangels, and all Farm Seeds and Fodder Crops. Special Fodder Circulars issued each Season. Send your name and address and we will forward copies to you.

OUR SPECIALTIES

Poa Aquatica

The King of Swamp Grasses

A tall, perennial, reed-like grass, growing to a height of 6 ft. Like most grasses with creeping roots, it is easily propagated by planting out, which is effected very simply by throwing roots into shallow water. With swamps that hold the water all the year round, it would be difficult to find a more suitable grass, for the amount of pasture it produces is extraordinary. Dairy Cattle are particularly fond of POA AQUATICA, and on Dairy Farms with swampy ground, considerable quantities have been established to great advantage. Cattle will walk right into the swamps, right up to their bellies, to get it. It not only affords rich pasturage in Summer, but forms the chief part of Winter Fodder, and will give immediate results in both Summer and Winter growth. Without doubt, one of the best feed grasses yet introduced. Only obtainable in roots, £2 per sack. **We are the Sole Distributors.**

"Mortgage Lifter" Oat

This new Oat grows to a height of 6 feet, and has yielded from 90 to 100 bushels to the acre. One grower reports very satisfactory results, obtaining 61 bushels in spite of a very dry season. Graded, re-machined, clipped, and tailed, 10/6 bushel; 9/6 bushel in sack lots; 9/- bushel in 5-sack lots; f.o.b. Melbourne.

Ruakura Rust Resisting Oat

Extremely rust-resistant, and a very good cropper. Slightly grey in colour, the Oat is thin skinned, and of fine quality, the bushel weight—the true test of value— being 46 lbs. The heavy-weighing Oat has naturally a good kernel. Price, 10/6 bushel; 9/6 bushel in sack lots; 9/- bushel in 5-sack lots; f.o.b. Melbourne.

Lucerne, the King of Fodder Crops.

Lucerne will fatten Cattle, Sheep, Pigs, etc., better than any other feed and with less expense. All our Lucernes are specially machine-cleaned, hand-sieved, free from dodder, and true to name, and have passed the Government Test. HUNTER RIVER LUCERNE—great scarcity of this splendid variety. Book your order now. Demand exceeds supply. Prices on application.

Paspalum Dilatatum.

A valuable grass for all stock, particularly suitable for Dairy Cattle. Withstands drought; stands any amount of grazing.

Paspalum Distichum.

An aquatic grass, growing to perfection on flooded flats. Has great carrying capacity; stock relish it and put on condition quickly. Easily grown from roots. Price, 35/- a bag.

LAW SOMNER Pty. Ltd.

WHOLESALE AND RETAIL
SEED AND PLANT MERCHANTS,

HEADQUARTERS:

139-141 SWANSTON STREET, MELBOURNE, VICTORIA.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or, at the earliest, in warm, early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist Spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave plants (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit

from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frosts, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth and that weak, so that the fruit produced thereon is small, it is advisable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to over-produce fruit spurs, which become long and straggling, and bear a large quantity of small-sized fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark, in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
2	6·14	5·15	6·32	5·0	6·40	5·4	6·29	5·19
3	6·15	5·15	6·33	4·59	6·40	5·4	6·29	5·19
4	6·15	5·14	6·33	4·59	6·40	5·4	6·28	5·20
5	6·16	5·14	6·33	4·59	6·40	5·5	6·27	5·20
6	6·17	5·13	6·34	4·59	6·40	5·5	6·27	5·21
7	6·17	5·12	6·34	4·59	6·40	5·5	6·26	5·21
8	6·18	5·12	6·34	4·59	6·40	5·6	6·25	5·22
9	6·18	5·11	6·35	4·59	6·40	5·6	6·24	5·22
10	6·19	5·10	6·35	4·59	6·40	5·6	6 23	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·8	6·36	5·0	6·39	5·7	6·22	5·24
13	6·21	5·8	6·36	5·0	6·39	5·8	6·21	5·24
14	6·21	5·7	6·36	5·0	6·39	5·8	6·20	5·25
15	6·22	5·6	6·36	5·0	6·38	5·9	6·19	5·26
16	6·22	5·6	6·37	5·0	6·38	5·9	6·18	5·26
17	6·23	5·5	6·37	5·0	6·38	5·10	6·17	5·27
18	6·23	5·5	6·38	5·0	6·37	5·10	6·16	5·27
19	6·24	5·4	6·38	5·0	6·37	5·11	6·16	5·28
20	6·25	5·4	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·39	5·0	6·36	5·12	6·14	5·28
22	6·26	5·3	6·39	5·0	6·35	5·13	6·13	5·29
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	2·27	5·3	6·39	5·1	6·34	5·14	6·11	5·30
25	6·28	5·2	6·39	5·2	6 34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·2	6·33	5·15	6·9	5·30
27	6·29	5·2	6·39	5·2	6·33	5·15	6·8	5·31
28	6·29	5·1	6·39	5·3	6·32	5·16	6·7	5·31
29	6·30	5·1	6·39	5·3	6·32	5·16	6 6	5·32
30	6·30	5·1	6·39	5·3	6·31	5·17	6·5	5·32
31	6·31	5·1	...	...	6·31	5·17	6·4	5.33

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria).

			H.	M.	
3 May	○	Full Moon	11	47	a.m.
11 „	☽	Last Quarter	3	51	p.m.
18 „	●	New Moon	4	24	p.m.
25 „	☾	First Quarter	7	7	a.m.

Apogee on 7th at 6 a.m. Perigee on 19th at 4 p.m. The Moon will be totally eclipsed on the 3rd at midday, but will not be visible in Australia. It will cause a partial eclipse of the Sun on the 18th, visible in parts of Queensland about sunset.

2 June	○	Full Moon	3	18	a.m.
10 „	☽	Last Quarter	4	58	a.m.
16 „	●	New Moon	11	41	p.m.
23 „	☾	First Quarter	4	49	p.m.

Apogee on 3rd at 2·30 p.m. and on 30th at 5 p.m. Perigee on 17th at 1·12 a.m. The Moon will occult Mars and Spica on the 25th, not visible in Australia unfortunately, but on the 28th the occulation of a small star in the Scorpion about 6 p.m will be an interesting sight in small telescopes and binoculars.

1 July	○	Full Moon	6	41	p.m.
9 „	☽	Last Quarter	3	5	p.m.
16 „	●	New Moon	6	25	a.m.
23 „	☾	First Quarter	5	20	a.m.
31 „	○	Full Moon	9	19	a.m

Perigee on 15th at 10·24 a.m. Apogee 28th, 12·24 a.m.

7 Aug.	☽	Last Quarter	10	50	p.m.
14 „	●	New Moon	1	44	p.m.
21 „	☾	First Quarter	8	52	p.m.
29 „	○	Full Moon	11	3	p.m.

Perigee on 12th at 3·48 p.m. Apogee on 24th at 2·36 p.m. On the 8th and 9th of August the planets Venus and Jupiter will appear to be in juxtaposition, but will be too near to the Sun to be seen to much advantage without a telescope or binoculars. They will be about ten degrees south-east of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

SHORTHAND that IS

26:6:26 System

You must think mechanically when writing Shorthand. You haven't time to hesitate. All your outlines must come off the pencil point like greased lightning.

If your mind is crammed full and overflowing with rules, exceptions, contractions, gramalogues, &c., you are taxing it. You can't think mechanically.

Look how many people who take up Standard Systems fail to master them. Why? These Systems are too difficult. The amount students are asked to memorise is beyond them. They haven't the time.

What you want is something quick to learn and easy to retain.

A SYSTEM WITH A SIMPLE THEORY.

Bradshaw's have this simple efficient system, and call it

26:6:26 SHORTHAND.

26:6:26 has only nine rules (no exceptions to these rules). No contractions. No gramalogues. No disjointed vowels. No positional writing.

The System is set out in five easy lessons and is all so simple you cannot help thinking mechanically.

The acid test **"Results"** prove that
Learning **26:6:26** System is a matter of **HOURS** not **MONTHS.**

Miss P—— working 2 hours daily mastered the theory in 12 hours.

Miss T—— working 1 night weekly mastered the theory in 6 hours.

Mr. D—— working 1 hour daily mastered the theory in 11 hours.

Miss W—— who learnt the theory in 12 hours is now doing 100 words p. m. at the end of further 30 hours.

Miss D—— who learnt the theory in 24 hours is now writing 100 words p. m. at the end of further 31 hours.

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16

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1920.	Mar., 1919.		Mar.	No. of Years' Records.	Mar., 1920.	Mar., 1919.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	8·64	19	1·02	5·99	Nambour	9·85	24	6·10	8·87
Cairns	18·14	38	6·96	6·23	Nanango	3·42	38	1·28	4·93
Cardwell	16·59	48	5·68	3·82	Rockhampton ...	5·21	33	1·61	3·13
Cooktown	15·00	44	3 52	8·63	Woodford	8·40	33	1·85	5·92
Herberton	8·22	33	1·86	2·71					
Ingham	16·57	28	8·09	5·62					
Innisfail	27·18	39	8·01	13·99					
Mossman	18·92	12	9·07	5·11	*Darling Downs.*				
Townsville	8·11	49	1·86	1·95					
					Dalby	2·84	50	0·62	1·80
					Emu Vale	2·81	24	1·90	5·62
Central Coast.					Jimbour	2·73	32	0·74	3·34
					Miles	2·86	35	0·45	1·61
Ayr	7·58	33	1·55	3·07	Stanthorpe ...	2·84	47	2·03	6·55
Bowen	5·98	49	0·61	3·06	Toowoomba ...	3·99	48	1·25	5·25
Charters Towers ...	3·66	38	1·17	1·80	Warwick	2·96	33	1·49	5·31
Mackay	12·50	49	2·45	4·45					
Proserpine	12·30	17	5·75	6·61					
St. Lawrence ...	6·21	49	0·25	2·41	*Maranoa.*				
					Roma	2·91	46	0·29	1·20
South Coast.									
Biggenden	4·46	21	1·55	2·71	*State Farms, &c.*				
Bundaberg	5·72	37	1·72	5·37					
Brisbane	5·86	69	1·80	6·02	Bungeworgorai ...	1·85	6	0·59	1·02
Childers	5·34	25	2·18	4·46	Gatton College ...	3·63	21	1·88	5·35
Crohamhurst ...	12·24	27	4·15	11·25	Gindie	3·02	21	2·06	0·15
Esk	5·00	33	2·31	6·29	Hermitage ...	2·87	14	1·34	5·65
Gayndah	3·31	49	2·32	4·94	Kairi	5·20	6	1·58	3·36
Gympie	6·41	50	2·31	5·60	Sugar Experiment Station, Mackay	11·73	23	2·04	1·92
Glasshouse M'tains	10·00	12	2·52	9·29	Warren	2·61	6	5·95	0·87
Kilkivan	4·16	41	0·52	4·25					
Maryborough ...	6·52	49	2·24	4·97					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1919, having been compiled from telegraphic reports, are subject to revision.

J. H. HARTSHORN, Acting State Meteorologist.